

THE PAN-PACIFIC ENTOMOLOGIST



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San Francisco, California

1952

THE PAN-PACIFIC ENTOMOLOGIST

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ON THE IDENTITY OF ADLERZIA FOREL

(Hymenoptera: Formicidae)

WILLIAM L. BROWN, JR.

Museum of Comparative Zoology, Cambridge, Mass.

It would be difficult to find a subfamily of insects in which generic placement of a given specimen is as difficult as in the Myrmicinae. The standard keys of Emery and Wheeler, both published in 1922, are virtually useless in determining many genera even when in the hands of a myrmecologist with long experience. This unhappy situation reflects the chaotic state of myrmicine classification even as it stood in 1922. In that year, so many genera were wrongly defined, synonymous with others, or hopelessly heterogeneous in composition that one is astonished that the aforementioned authors had the courage to attempt keys to the world genera without first radically altering the classification. Of course, it must be said that such alteration might well consume a lifetime without particularly satisfactory results achieved in the end, and evidently the opinion then was that any key, however imperfect, was better than none. After a quarter century of description from various quarters, one may well doubt the wisdom of this opinion.

Authors since 1922 have been all too content to accept the keys, which are similar and therefore seem to support each other, as practically the only basis for generic identification. In this way, a great crop of generic synonyms has arisen during the last 25 years or so, and, what is worse, very many species have been steered through the dichotomies, missed a turn, and ended as new species in the wrong genus. The phylogeny and limits of the genera have now become so obscure that the most accomplished myrmecographer finds many generic assignments impossible or very highly uncertain.

In the earlier days, up to about 1900, it was possible for a specialist to have a fair idea of the species of the entire family and their proper generic assignments. However, the earlier workers have sown the seeds of the chaos now prevailing, for, knowing the species and genera by habitus more than by the characters they themselves had used in definition, they too often added species

without reference to the crucial characters used to delimit the genera. Most of the work was hasty in the extreme, with species thrown chock-a-block into the handiest receptacle or else arbitrarily made the type of a new genus or subgenus.

The subgenus particularly has been a refuge for the uncertain specialist confronted with inadequate material, and the myrmecological world is only now awakening to the fact that most of the subgenera are really either indefensible as such or else are good genera. In the latter category belong many familiar names among ants, formerly placed as subgenera in large genera like *Atta*, *Dorylus*, *Eciton*, *Dolichoderus*, *Polyrhachis*, *Lasius*, *Strumigenys*, *Solenopsis*, *Monomorium* and many others. The subgenus will continue to have its function for a long while yet, but the time has come to embrace and expand the critical study of subgenera begun by Borgmeier, Creighton, and others.

As a small contribution to the tremendous job which lies before us, of unscrambling the genera of the Myrmicinae, and as a miniature illustration of the self-propagating confusion of ant taxonomy as it is today, I should like to bring to the reader's attention the case of the ant going under the name *Monomorium* (*Adlerzia*) *froggatti* Forel.

Forel proposed the new subgenus *Adlerzia* and assigned it to *Monomorium* on the basis of a single small worker ant (*froggatti*) described as new at the same time in Rev. Suisse Zool., X, pp. 445-447 (1902). There it has remained buried without again being reported from its homeland in southeastern Australia.

In 1950, while passing through Sydney on my way north to Queensland, I spent a day collecting in the woods along the golf links at Pymble, an outer suburb of Sydney I had heard of through Father McAreavey of Melbourne. Among other ants taken was one series, found in a nest of *Camponotus consobrinus* (Erichson) under a large stone, of small tawny ants with highly dimorphic workers. These ants seen in the field fitted my rather sketchy idea of *Machomyrma* Forel as remembered from the literature and specimens in the Wheeler Collection casually examined in past years. I then put the specimens in alcohol and forgot them.

Upon my return home, I mounted these and several hundred other specimens obtained during my trip, and during the process of mounting, one of the minor workers of my "*Machomyrma*" somehow got placed on a point by itself, without an accompanying

soldier. When the remainder of the specimens had been mounted, workers and soldiers to each pin, I began the rough sorting of my collections to genera. As is usual with dimorphic myrmicines, I sorted the species falling into this category by examining the large-headed soldiers, and did not pay much attention to minor workers. Soon, however, I was confronted by my accidentally-segregated minor worker. The ant was not at all familiar to me. Reaching for Wheeler's key to the genera (*loc. cit.*), I then spent an hour or so running out to blind ends in the dichotomies and finally came uneasily to rest with my specimen in *Monomorium* subgenus *Adlerzia*.

Reference to the Genera Insectorum (Emery, *op. cit.*, p. 182) convinced me that I was in the correct genus, and I labelled the specimen accordingly. Later on the same date, I chanced to be verifying my determination of the "*Machomyrma*" soldiers with accompanying workers, and happened to look more closely at the latter. To my astonishment, I found them identical with the specimen just placed in *Adlerzia*, and this was confirmed by careful comparison. Investigation proved that all had come from the same nest series, and there could be no doubt that the workers and soldiers were different castes of the same species.

My first thought was that *Adlerzia* might have to be synonymized under *Machomyrma* Forel, for the soldiers keyed to this genus in both Wheeler's and Emery's tables. However, I checked with Dr. Charles Ferrière, of the Museum d'Histoire Naturelle, Geneva, who kindly sent camera lucida sketches and a brief characterization of the unique type of *M. (Adlerzia) froggatti*; these proved beyond a reasonable doubt that my identification of the worker had been correct.

Upon my request, Dr. Ferrière and Dr. M. R. Smith both graciously sent information concerning the two known species of *Machomyrma* Forel, as the original descriptions are not presently available to me. Although a definite conclusion is not safely reached until the types of the genotype, *Machomyrma dispar* Forel, and the additional species, *M. silvestrii* Emery, are directly studied, the indications are that the two *Machomyrma* species are not congeneric. The *M. silvestrii* characterization and figures seem to place this ant solidly in *Adlerzia* with *A. froggatti*, and it is quite possible that the two are synonymous.

One fact is clear: *Adlerzia* has no connection with *Monomo-*

rium. Rather, it seems to go into the tribe Pheidolini, and I here place it provisionally as a distinct genus. The new arrangement may be schematized as follows:

MACHOMYRMA Forel

Genotype: *Liomyrmex* (*Machomyrma*) *dispar* Forel, 1895, Monobasic.

ADLERZIA Forel (NEW STATUS; TRIBAL TRANSFER)

Genotype: *Monomorium* (*Adlerzia*) *froggatti* Forel, 1902, Monobasic.

Additional species: *Adlerzia silvestrii* (Emery), 1914.

For full references and generic characteristics, see Emery, 1922, *Genera Insectorum*, Fascicule 174, pp. 76-77 (*Machomyrma*) and pp. 168, 182 (*Adlerzia*).

I have dwelt at some length on this small taxonomic puzzle because it points up so starkly the deficiencies in the keys and in the basic classification of the ants. It is far from being an isolated example; many tangles of much greater scope and difficulty exist, becoming ever aggravated by the addition of new species year by year.

In our present-day studies of the group, there is far too much isolated description of one or a few species or subspecies scattered through many genera of ants, and far too little work of a broad revisionary nature. Creighton, Borgmeier and a few others have shown the way out of the tangle, but the majority of myrmecologists have been slow to follow. Our first and most urgent task is the reduction of the synonymy at the species- and subspecies-levels, for this synonymy has virtually stifled intelligent revision of the larger and more difficult groups under the sheer weight of numbers of presently-unchallenged and insufficiently identified names. Probably as much as 25 to 50 per cent of the names in some genera are unrecognized synonyms; this percentage, when applied to a genus like *Camponotus*, with more than 1,000 current names, is enough to discourage any reviser from taking a world approach. I find it a good rule to establish at least one clearcut synonymy for each new name I propose. Unfortunately, the establishment of one certain synonym almost invariably occupies far more time than did the original description of the synonym. New synonymy should be clearly labelled as such and provided with the original references, so that cataloguers can easily detect and disseminate it as they would newly-described species. A system which makes new synonymy bear a greater burden of proof and investigative effort than

does description of novelties is bound to perish under the weight of its own accretion. It is small comfort to this myrmecologist to realize that 1950 (with the publication of Creighton's "Ants of North America") is probably the first year in a century that the number of unrecognized synonyms did not gain on that of good species and subspecies.

REFERENCES

(Keys to the genera of the Myrmicinae in:)

EMERY, C.

1922. Genera Insectorum: Formicidae, Myrmicinae, Fascicule 174.
(Keys in sections throughout.)

WHEELER, W. M.

1922. Bull. Amer. Mus. Nat. Hist., XLV, part 7; cf. pp. 655-687.

NOTES ON NESTING AND HIBERNATION OF POLISTES

(Hymenoptera: Vespidae)

ROBERT SNELLING

Turlock, California

Students have known for some time that occasionally two females (queens) of *Polistes* will found a nest together. Those recorded were noted to be of the same species. However, on one occasion I have taken a female each of *Polistes fuscatus aurifer* Saussure¹ and *P. apachus* Saussure contributing toward a future colony together. As they were watched for some time there is very little chance of an error. In a letter of January 30, 1951, J. C. Bequaert comments that, "Whether queens of different species would be successful in this is not known." Unfortunately, I collected the wasps and nest at once. At the time, there were thirteen cells with larvae and eggs.

In hibernation, the social Vespidae are rather gregarious. At various times I have taken *P. f. aurifer*, *P. apachus*, *P. hunteri californicus* Bohart, *Vespula pennsylvanica* Saussure, and *Mischocyttarus flavitarsis* Saussure hibernating together. In fact, I have taken three of *aurifer*, seven of *P. h. californicus*, two of *M. flavitarsis* and a few inches away, several of *V. pennsylvanica*.

¹ The wasps were identified by Dr. R. M. Bohart. I am indebted to him and to Dr. J. C. Bequaert for help.

BOOK REVIEW

GUIDE TO THE INSECTS OF CONNECTICUT. PART VI. THE DIP-
TERA OR TRUE FLIES. FIFTH FASCICLE: MIDGES AND GNATS.

State of Connecticut Geological and Natural History Survey, Bulletin
No. 80, viii + 255 pp. March, 1952. Price \$2.50.

This new addition to the "Insects of Connecticut" series comprises a taxonomic review of the "gnats" or "midges" belonging to the families Tendipedidae (=Chironomidae), Heleidae (=Ceratopogonidae) and Fungivoridae (=Mycetophilidae). The authors, all widely recognized authorities in the groups which they present, are O. A. Johannsen, Henry K. Townes, Frank R. Shaw and Elizabeth G. Fisher. For all three families keys are given to the subfamilies and genera occurring in North America and to the species as they are known to occur in the "Northeast," or the region east of the Mississippi River and north of the southern boundary of Virginia. The authors have all adopted (though apparently under editorial duress in one case) the genera proposed by J. W. Meigen in 1800 thus necessitating changes in subfamily and family names.

The Tendipedidae, exclusive of the tribe Tendipedini, and the section on the family Heleidae, are by Johannsen. For the Tendipedidae there are keys to some 147 species recorded from the Northeast; for the Heleidae, keys to an equal number of species and illustrations of wings, male terminalia and other features for many of them.

The Tendipedini are presented by Townes as an abridgement of his recent monograph of the nearctic representatives of the tribe. He includes keys to upwards of 170 species and varieties known from the Northeast, and lists 16 species as unrecognizable without reference to the type specimens, which are either lost or not readily available for close study. There are 22 plates with excellent drawings of the male terminalia of 163 species and numerous illustrations of wings, legs and other features. In addition there are brief descriptions of each species and its recorded occurrence. Shaw and Fisher in collaboration here give the first comprehensive treatment of the Fungivoridae since Johannsen's monograph (1909-1912). There is a discussion of the ideas of various previous authors regarding the interrelationships and phylogeny of the Fungivoridae. Shaw's studies on the thoracic structures in relation to phylogeny are summarized briefly. In general the classification of Edwards (1925) has been followed. The "Lycoriidae" are considered again to be of only subfamilial rank, though this must be due to an oversight in revision of the manuscript since (Shaw (1948, 1952) considers the Lycoriidae to represent a family distinct from the Mycetophilidae. The keys differentiate over 290 species and varieties from the Northeast. There are illustrations of wings and male terminalia of several of the more difficult species and also several drawings of thoraces to show the proposed phylogenetic relationship of different genera.

A bibliography of nearly six pages lists many of the more important references to the three families. There is also a complete index to all names and illustrations. All in all this fascicle lives up to the example of its predecessors and should prove to be a most distinguished number of the "Insects of Connecticut" series.—WILLIAM C. BENTINCK.

NEW WESTERN EPHEMEROPTERA, IV, WITH NOTES

VELMA KNOX MAYO

1216 N. Fremont, Tucson, Arizona

Ephemerella lodi Mayo, new species

(Figures 1, 3, 10)

Male imago (fig. 10). Member of *bicolor*-group. Head yellow; dark brown around ocelli. Pronotum yellowish-brown tinged with red; reddish-brown penciling anteriorly on midline and laterally. Thorax reddish-brown. Mesonotum yellowish-brown dorsally, paler along midline. Laterally mesonotum reddish. Pleural sclerites reddish-brown with unsclerotized areas powdery white. Wings slightly amber tinged; venation yellow; veins in stigmatic area anastomosed. Legs yellow; fore coxae tinged with red anteriorly; femora yellow; no dark apical dot; fore tibiae yellow, reddish at tarsal joining; fore tarsi yellow, joinings narrowly penciled with red; claws reddish-brown; hind legs pale yellow, not marked with red at joinings. Abdomen lighter than thorax. Tergites 1-3 reddish-brown, bordered posteriorly by a wide brown band. On either side of midline are blackish streaks, prominent anteriorly and faded out towards posterior margin. The midline of all tergites marked with a reddish streak. Tergites 4-10 yellowish, washed with reddish-brown posteriorly. Tergites 8-9 with reddish streak near pleural fold. Blackish spots on either side of midline are very prominent, the streaks less distinct than those on tergites 1-3. Laterally each tergite marked with black oblique streak near pleural fold. Dark tracheations along pleural fold. Abdominal sternites with a distinct curved row of four dark dots, represented by two oblique streaks, and medially, by prominent dots. No ganglionic markings on sternites. Segments 3-5 pale, other segments with reddish tinge. Genitalia yellow. Tails yellow, joinings dark reddish-brown. Length: body 10.5 mm., wing 10 mm.

Female imago (fig. 3). Head yellowish with red pencilings on vertex and two red spots anterior to ocelli, blackish around bases of ocelli. Pronotum yellowish; irregularly marked with red, red streak along midline. Mesothorax reddish-brown. Mesonotum more red than that of male. Scutellum marked medially with red streak, and laterally wing bases tinged with red as in male. Legs yellow; claws faintly tinged with brown. Wings as in male except for reddish coloring at bases of subcosta and radius on anterior surface of wing. Abdomen more reddish than that of male; tergites irregularly mottled with red; along middorsal line is a wide mottled streak; tergites 1-5 with wide reddish-brown streaks on either side of midline; where the lateral streaks touch the anterior border, the margin is narrowly streaked with black; red, medially; on tergites 6-10 prominent black dots take the place of the reddish-brown streaks of preceding segments; irregular reddish markings on lateral tergites; pleural fold red; sternites paler than tergites, yellowish; row of curved black dots on sternites, prominent on segments 1-5; mid ventral ganglionic area reddish-brown on sternite five, absent on others. Dark tracheations prominent laterally. Tails as in male. Subanal plate as in fig. 3.

Holotype: male imago (in alcohol). DRY CREEK NEAR DRY

TOWN, CALIFORNIA, June 2, 1938, altitude 1700 ft. Allotype, female imago (in alcohol) same data. Paratypes one male imago, two female imagos, same data. In collection of writer, except the male paratype which is in the California Academy of Sciences, San Francisco.

The *bicolor*-group has not heretofore been represented among the known western species. *E. lodi* Mayo is allied to *E. temporalis* McDunnough and to *E. doris* Needham, but is larger than the eastern forms. Alcoholic specimens of *E. temporalis* McDunnough were loaned for comparison. The general coloring is more reddish than that of *E. temporalis*. The wings are yellow tinged and the venation yellow in contrast to the hyaline wings of *E. temporalis*. No dark dot apically on femora as in *E. temporalis*. Abdominal tergites not deep brown. No ganglionic markings on sternites of male.

BICOLOR nymph

(Figure 1)

Mr. George F. Edmunds, Jr. presented to me for study the *bicolor* nymph figured in fig. 1. I do not declare this the nymph of *Ephemerella lodi* because it has not as yet been reared. However, due to the larger size of both the nymph here figured and also of *Ephemerella lodi*, and to the similarity in type localities I recognize the possibility that the two might be the same species and enter both descriptions here.

General color dark brown sprinkled with pale dots and larger pale areas as in figure. No occipital tubercles in female. Dorsal abdominal tubercles lacking on segment 1. On segment 2 they are better developed than on other tergites, but not very long; about half the length of the distance between them, and rounded at the ends; smoky in color and marked at base with pale area. Three or four pale dots on tergites between tubercles. On tergite 3 dorsal spines smaller than those on tergite 2 and all dorsal spines decrease in size to rearward; those on segments 9-10 very minute. Spines on all tergites parallel. Width between dorsal abdominal spines on segments 5-7 less than length of tergites in median line. Tergites between tubercles rich brown sprinkled with pale dots; lateral to tubercles is a pale streak from anterior to posterior margins of segment. On segments 9-10 two narrow, pale streaks extend from anterior margins to tubercles; large pale areas as in figure. Tails dark brown, banded with pale areas; long fringe of hairs. Tails cut short in figure. Length body, 11-12 mm. Tails 8 mm.

Two female nymphs, in the collection of Mr. George F. Edmunds, Jr. Collected by E. P. Hughes north of Peoria Slough, altitude 259 ft., near Corvallis, Oregon, May 16, 1947.

HEPTAGENIA KENNEDYI McDunnough

(Figures 8, 9)

These were found to be common in the Jackson area in Amador County, California. The genitalia were treated in KOH and the number of median spines apparent are of interest (see figs. 8, 9).

Male imago, pinned (figs. 8, 9). Head brown, eyes black. Pronotum blackish along posterior border. Mesonotum yellowish-brown, bordered by dark brown on prescutum. Sutures rose tinged. The mesoscutellum and metanotum brown, speckled near wing bases. Pleuron yellow. Wings hyaline, iridescent; venation white. Fore coxae and trochanters yellow; femora reddish-brown; tibiae and tarsi dark brown, lighter than femora; femora and tibiae blackish at joinings; claws black. First tarsal segment one-fifth length of second. Middle and hind legs yellow tinged with brown along anterior border of femora and tarsi. Abdominal tergites all dark brown on posterior borders giving a distinct ringed appearance. Tergites 2-6 hyaline; tergites 7-9 brown with three yellow streaks along midline; tergite 10 lighter. Abdominal sternites 1-6 hyaline, 7-9 opaque; pale yellow. Tails brown tinged with rose, darker basally. Forceps amber tinged with rose; segments 3 and 4 of forceps together not quite as long as segment 2; 3 longer than 4. Penes amber; each with apical lobe, also with small lateral spines (see figs. 8, 9); ventrally there are three pair of spines, one very prominent, heavily sclerotized at tip, with an unsclerotized ring-like area behind tip; the other two sclerotized pieces are not so prominent, but easily detected in a specimen treated with KOH; dorsally there is a fourth pair of very large, heavily sclerotized spines. Length: body, 6-7 mm., wing, 8 mm.

Alcoholic specimens: eyes grey in some, black in others. Forelegs more pale; femora yellowish-brown, tibiae yellow with blackish joinings. Tails more pale.

Female imago, pinned; similar to male, but abdominal tergites not so distinctly ringed. In alcohol, the abdomen not ringed.

Specimens taken from Dry Creek near Dry Town, Amador County, California, June 1, 2, 14, 1938. One male imago, Amador Creek near Amador, California, May 29, 1938. This specimen is larger; length body 9.5 mm., wing 9 mm., tails pale. One imago in alcohol in collection of California Academy of Sciences. Rest of material in collection of writer.

HEPTAGENIA species number 1

(Figures 2, 6)

Male imago; reddish brown. Bases of ocelli black. Eyes grey. Pronotum mottled with red medially; anterior and posterior margins dark reddish. Pronotum yellowish laterally. Mesonotum reddish-yellow washed with red in anterior portion; sutures posteriorly tinged with red. Tergites 3-6 semi-hyaline, washed with red; 1-2 more mottled with red; 7-10 opaque, reddish-brown. Wings hyaline; veins pale yellow; stigmatic area milky. Pro- and mesopleura marked with dark reddish-brown stripe, which extends across the procoxa, around the first spiracle on the mesoepisternum and on the

epimeron at base of mesocoxa; a whitish area above first spiracle anterior to wing base. Pleuron reddish-yellow; metapleuron tinged with red around bases of coxa. All trochanters yellow (rest of legs missing in this specimen). Abdominal tergites and sternites pale along pleural fold. Large tracheal trunk and branches visible but colorless. Sternites pale except last three of abdomen which are opaque, reddish-yellow. Penes with four pair of spines (see fig. 6). The large medial spines (fig. 2) are bent at an acute angle and from the ventral view only the tips can be seen; on each side there is a sclerotized ridge for the attachment of heavy muscles (see fig. 6). The fourth segment of forceps is only slightly more than one-half the length of third segment. Segments 3 and 4 together are slightly more than one-half length second segment. Length: body, 7 mm., wing 7 mm.

One specimen taken from Dry Creek, near Dry Town, California, June 1, 1938. In collection of the writer. This specimen is undoubtedly closely allied to several western forms; *H. otiosa* McDunnough from Oregon; *H. criddlei* McDunnough from Wyoming; *H. rodocki* Traver from Idaho; *H. rubroventris* Traver, California, and *H. rosea* Traver, Oregon. The general coloration and details of the genitalia separate it from all but *H. rodocki*. I do not believe the median spines on penes of "*H. species number 1*" are capable of rotation near middle as are those of *H. rodocki*. The abdominal maculation differs in the one specimen at hand. I hope to be able to make a more thorough study of this group when more material is available.

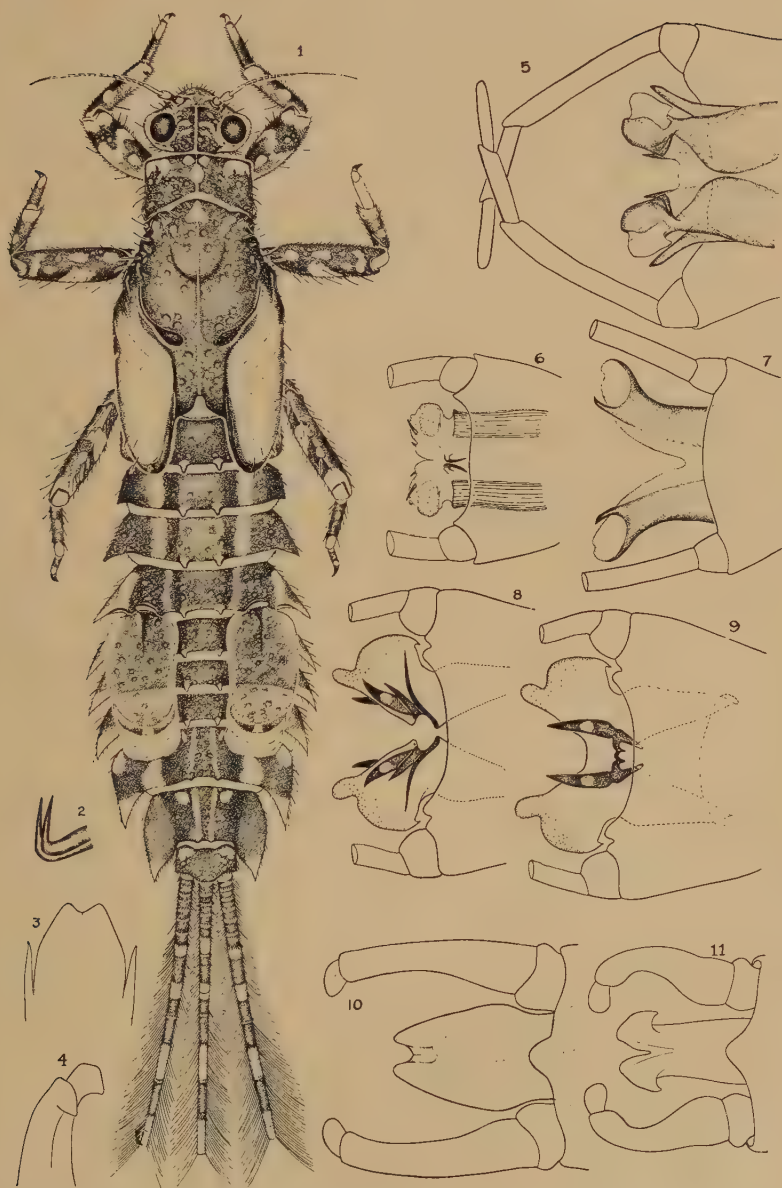
CINYGMULA PAR Eaton

(Figure 5)

Male imago, pinned (fig. 5). Head reddish-brown; white around bases of antennae. Thoracic notum black with a bluish tinge; tinged with brown laterally at wing bases. Pleural sclerites black; unsclerotized areas brown, with a pale area at wing base. Pleural wing recess black. Thoracic sternum black. Wings hyaline, iridescent except near base where they are tinged with brown; also lightly tinged in stigmatic area; venation light brown; cross veins not margined. Forelegs black; claws lighter, dissimilar; middle and hind legs dark brown; tarsi paler. Abdomen semi-hyaline; tergites washed with light brown in posterior portions, posterior borders slightly darkened with brown; anterior borders of segments 2-7 hyaline, producing an annulated effect; tergites 1-2 darker brown, 3-7 pale, 8-10 dark brown; all tergites with brown tracheations. Abdominal sternites 1-2 light brown;

EXPLANATION OF FIGURES

Figure 1—Nymph of *bicolor*-group of *Ephemerella*. Figure 2—Median spines on penes of *Heptagenia* species number 1. Figure 3—Subanal plate female, *Ephemerella lodi*, new species. Figure 4—Lateral view penes, *Ephemerella* species number 2. Figure 5—Male genitalia *Cinygmula par* Eaton. Figure 6—Male genitalia *Heptagenia* species number 1. Figure 7—Male



genitalia *Cinygmula tioga* new species. Figure 8—Ventral view male genitalia *Heptagenia kennedyi* McDunnough. Figure 9—Dorsal view, same, of *H. kennedyi*. Figure 10—Male genitalia *Ephemerella lodi* new species. Figure 11—Male genitalia *Ephemerella* species number 1.

2-6 hyaline except for prominent dark brown ganglionic markings; 7 opaque white, 8-9 darker. Forceps and forceps base blackish. Penes with lateral and medial spines (sclerotized areas of penes represented by shading in figure), tails dark brown basally, lighter distally.

Female, pinned. More uniformly colored than male. Head blackish-brown; thorax black; notum black tinged with brown posteriorly. Wings hyaline, tinged but slightly near base; much less so than in male. Legs reddish-brown. Abdominal sternites more uniformly brown than those of male; sternites 3-6 pale with dark brown ganglionic markings, 7-8 brown, 9 pale with subanal plate dark smoky. Tails light brown.

Two male imagos, pinned. Shadow Creek near Minaret Glacier, Madera County, Sierra Nevada of California; altitude 9,560 ft., September 10, 1939. Female imago, pinned, same data; vial of alcoholic material both sexes, same data.

General coloring different from that of the type of *C. par*, black in contrast to the light brown coloring of the type. Dr. Herman T. Spieth writes the following about the type of *C. par* Eaton:

"There is no sign of the blackish or sepia pigmentation being intermixed into the brown ground color. The specimens appear brownish yellow rather than blackish brown . . . Penes very much like those of *confusa* McD. and *C. hyalina* McD."

The wings of these specimens are not grey-tinged as are those of the type. One male imago in alcohol in California Academy of Sciences. Other specimens in collection of writer.

Cinygmula tioga Mayo, new species

(Figure 7)

Male imago (fig. 7). Pale species with uniform amber tinged wings. Head yellowish; wide black bands around ocelli; fine brown pencilings on vertex. Pronotum visible only from sides, penciled with reddish brown. Mesonotum yellowish brown. Sutures and medial part of scutellum powdery white. Postscutellum and metanotum brown. Pleuron pale yellowish brown with powdery white in unsclerotized areas, particularly anterior to wing base. Wings tinged with amber; veins narrowly dark brown. Forelegs pale; femora yellowish, slightly smoky at tibial joining. Dark brown elbow at joining of tibiae and tarsus. First tarsal segment three-fourths length second. Joining of fourth and fifth tarsal segments narrowly brown. All claws similar; washed with brown. Tergites 1-8 semi-hyaline. The anterior margins of segments 2-8 are pale, the remainder of segments washed with brown, giving a banded appearance. Dark lateral tracheations on each of tergites 1-8. Tergites 8-10 yellowish brown. Sternites more pale than tergites; segments 1-8 hyaline; 8-9 opaque, yellowish brown. Slight traces of ganglia apparent by a few brown ventral markings in some specimens. Forceps brown (segments 3-4 have been broken off in all specimens). Sclerotized portions of penes brown, unsclerotized portions white. Penes each with one pair of medial spines. Tails light brown. Length: body 8 mm., wing 8.5 mm.

Female imago similar to male, but with paler wings. Abdominal tergites more opaque due to eggs in abdomen. Tracheations same as in male. No ventral ganglionic markings.

Holotype, male, and 7 male imagos (in alcohol) LEEVINING CREEK, SIERRA NEVADA MOUNTAINS, MONO COUNTY, CALIFORNIA, August 21, 1938, altitude 9,900 ft. Eight female imagos, same data. Four males in alcohol in collection of California Academy of Sciences. The rest in collection of writer.

Cinygmula tioga Mayo is related to *C. minus* Eaton. In general appearance *C. tioga* is paler, yellowish-brown; whereas *C. minus* is more of a chestnut brown. The wings of *C. minus* are darker in basal half of fore wing and in hind wing. In *C. tioga* they are uniformly tinged a lighter amber as in *C. uniformis* McDunnough. Venation in *C. minus* paler than that of *C. tioga*. The abdominal markings vary somewhat. There are no tracheations on tergites of *C. minus* and these are prominent on *C. tioga*. Traces of dark ventral markings entirely lacking on *C. minus*. Genitalia of the same type, but the spines on *C. tioga* are longer.

EPHEMERELLA species number 2

(Figures 4, 11)

Male imago (figs. 4, 11). Head yellowish-orange; dark brown around bases of antennae and ocelli. Prothorax yellowish-orange with dark brown tracheations. Cervical membrane rose colored. Mesonotum yellowish-orange, tinged with rose posteriorly, and around wing bases. Unsclerotized areas of the entire thorax are distinctly rose colored. The mesoepisternum posterior to spiracle and the epimeron are brown. Wings hyaline except in the stigmatic area. Venation very faint. Legs pale yellow. Fore femora yellowish apically, tibia tinged with brown at apical joinings and claws light brown. Abdominal tergites rose colored, darkened laterally. Anterior and posterior margins hyaline giving an annulate appearance to abdomen. Brown tracheations on tergites. Sternites also rose colored, but pale; the lateral anterior corners are darker rose and the prominent ganglionic markings are light brown. Genitalia somewhat as in *E. micheneri* Traver. Tails white with reddish joinings. Length: body 8 mm., wing 7 mm.

Two male imagos were taken from Dry Creek, near Dry Town, California, May 30, and June 2, 1938. In collection of writer.

"*Ephemerella* species number 2" is a member of the *Serrata* group and is similar to *E. micheneri* Traver. Possibly it may be identified as *E. micheneri* when more material is at hand, but in the two male imagos collected there are variable characters which are of interest. Coloring of entire body distinctly reddish. Blackish markings on pleura, coxae and sterna as described in *E. micheneri*. Forceps similar to those of *E. micheneri* and penes separated api-

cally by a V-shaped cleft. Each side is bent forward and ends in a sharp process which does not project upward in lateral view of *E. micheneri*. More conclusive evidence as to the identity of "*E.* species number 2" may be revealed when the nymphs are known and reared.

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SUGGESTIONS ON PREVENTING OUTBREAKS OF BARK BEETLES IN CALIFORNIAN PINE FORESTS

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The following suggestions result from observations made in Shasta County, California, during 1951. It is a pleasure to express my indebtedness to Dr. Ralph Hall and Mr. F. P. Keen, who enabled me to make use of the facilities of the entomological laboratory at Hat Creek, Shasta County.

The commonest and most important bark beetles in Californian forests are the following (quotations are from F. P. Keen's book "Insect enemies of western forests," U. S. Dept. Agric., Miscell. Publ. No. 273; 210 pp., 92 text figs. 1938).

1. *Dendroctonus brevicomis* LeConte.—"Normally it breeds in a few overmature trees, in windfalls, unhealthy trees, or in trees weakened by drouth, stand stagnation or fires."

2. *Dendroctonus monticolae* Hopkins.—"During endemic infestations there is a tendency for the beetles to select the weaker, less vigorous trees for attack, but no such selection is apparent during epidemic conditions."

3. *Dendroctonus jeffreyi* Hopkins.—"Although it often attacks trees that are apparently in a healthy condition it seems to prefer trees that are retarded in growth by droughts or defoliations."

4. *Ips emarginatus* LeConte.—"The emarginate ips (*I. emarginatus* Lec.) is most frequently found associated with the mountain pine beetle in its attacks on ponderosa pine, lodgepole pine,

and sugar pine, and with the Jeffrey pine beetle in Jeffrey pine, but is quite capable of and occasionally does kill trees on its own account."

Epidemic outbreaks of bark beetles in California must always have as a preliminary a great number of weakened or less vigorous trees. By comparison of conditions in places where there is no bark beetle problem with those in which there is damage, we see at once a difference in the extent to which tree trunks are exposed to the sun's rays. From an examination of forests in the mountainous regions, it is evident that the bark beetles have attacked only such trees as have been overexposed to the sun, and thus burnt or scalded. Such damage is not readily detected; the trees appear to be healthy, but the beetles are well able to distinguish them.

Because of their growth habits pines, especially ponderosa pine, have very few branches and twigs, and are unable to shade their trunks from the burning rays of the sun. Consequently they are very often attacked by bark beetles. When it is seen that there is a connection between tree trunk exposure and epidemics of bark beetles, a preventative control measure will obviously be the shading of such trunks from the sun's rays.

The forest trees of Shasta County can be divided into two groups, based on degree of resistance to the sun.

TREE SPECIES WHICH ARE VERY SENSITIVE TO THE SUN'S RAYS

- | | |
|------------------------------------|------------------------------------|
| 1. <i>Pinus ponderosa</i> Dougl. | —Ponderosa or western yellow pine. |
| 2. <i>Pinus jeffreyi</i> Vasey | —Jeffrey pine. |
| 3. <i>Pinus lambertiana</i> Dougl. | —Sugar pine. |
| 4. <i>Pinus contorta</i> Dougl. | —Lodgepole pine. |

TREE SPECIES WHICH CAN WITHSTAND THE SUN'S RAYS

- | | |
|--|------------------------|
| 1. <i>Libocedrus decurrens</i> Torr. | —Incense cedar. |
| 2. <i>Abies concolor</i> Lindl. & Gord. | —White fir. |
| 3. <i>Picea engelmannii</i> Engelm. | —Engelmann spruce. |
| 4. <i>Tsuga mertensiana</i> Sarg. | —Mountain hemlock. |
| 5. <i>Juniperus californica</i> Carr. | —California juniper. |
| 6. <i>Quercus kelloggii</i> Newb. | —Black oak. |
| 7. <i>Quercus douglasii</i> H. & A. | —Blue oak. |
| 8. <i>Prunus demissa</i> (Nutt.) Walp. | —Western choke cherry. |
| 9. <i>Prunus emarginata</i> (Dougl.) Walp. | —Bitter cherry |
| 10. <i>Ceanothus integerrimus</i> H. & A. | —Deer brush. |
| 11. <i>Arctostaphylos</i> sp. | —Manzanita. |

The degree of resistance to the sun's rays depends chiefly on the type and thickness of bark, and the density and distribution of foliage. The tree species which are very sensitive to the sun

should not be allowed to grow in pure stands, but should have incense cedar or other trees from the second group planted amongst them. Ponderosa pine does very well when in a mixed stand with incense cedar or white fir (individual trees of *P. ponderosa*, which have from youth been in exposed positions, are able to grow long low branches and protect themselves; but this does not apply in pure stands).

Man thus has an opportunity to make the pine forests more resistant to bark beetle epidemics, by adding sun-tolerant species to young stands of sun-sensitive trees. This work can be related to the establishment of fire protection strips, especially along roadways, since shade producing trees also reduce the fire hazard.

Of course such problems can not be solved by the entomologists alone, since botanical and economic matters are also involved. However, it seems clear that there are possibilities in this subject, and future generations will have much to thank us for if we can reduce both bark beetle and fire hazards.

A NEW SYNONYM IN XENORHIPIS

(Coleoptera: Buprestidae)

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Dr. Jan Obenberger in Vestnik Svazek VI-VII, Za Rok (1938-1939:338) described a new species of *Xenorhipis* under the name *X. Vejdovskyi*. The type series of *X. vejdovskyi* consisted of six specimens. Of the two in Obenberger's collection, one, which he acquired by purchase, is labeled from Connecticut, U.S.A., and the other, bearing no locality label "but most probably from the same collector" was sent to him in an exchange by the Museum d'Histoire Naturelle de Paris, bearing a label "*Xenorhipis Brendeli* LeConte." This second specimen belonged in turn to the Meyer-Darcis and Kerremans collections. The other four specimens of the series upon which he based his new species are designated thus: "I have seen, in Paris, in the collection of Kerremans, still some four specimens of the same new species." Dr. Obenberger had no specimens which he considered to be *X. brendeli* and based his comparative notes upon the description given by LeConte.

He contrasted certain characters of *X. brendeli* and his *X. vej-*

dovskyi and I have arranged these dichotomies in the forms of a table for ease of perusal.

<i>X. brendeli</i> LeConte	<i>X. vejovskyi</i> Obenberger
1. Body dull black with a brassy tinge.	Body black, without any brassy tinge.
2. Head convex with a broad medial furrow.	Head convex without any medial furrow.
3. Thorax (pronotum) quadrate with the angles acute, slightly channeled and marked with a strong transverse impression just before the middle.	Thorax (pronotum) transverse, having the greatest width on the basal third, rather strongly and obliquely attenuate to the base, very feebly to the anterior angles, feebly and equally convex, without any impressions.
4. Elytra dull black, with a brassy tinge, ornamented with a large pale spot which extends nearly one-third the length and fades insensibly into the black ground color.	Elytra pale yellow, with a long triangular scutellar macula, extending from the base nearly to the basal third, of the same black, piceous colour as the prothorax.
5. Sernum marked on each side with a large hairy depression.	Without any distinct hairy depression on sternum.
6. Length 5 mm.	Length 6 mm.
7. Illinois.	Connecticut.

Reviewing these characters, I was struck by the apparent tautological nature of the fourth dichotomy and the possible variability of some of the other characters. But by the time I decided I decided to pursue the matter farther it was impossible, because of international conditions, to carry on correspondence with Dr. Obenberger. Fortunately, however, I was able to secure the loan of two of the specimens in the Paris museum which were mentioned by Dr. Obenberger, through the kind cooperation of Mr. A. Descarpentries of that institution. These specimens are both from Crafton, Pennsylvania, Klages collector. They are labeled "*Brendeli* LeConte" and formed part of the Kerremans collection, being so labeled.

There are no other specimens of *Xenorhipis* in the Paris museum and there can be no doubt that these specimens are the ones alluded to by Dr. Obenberger. In the light of this, I feel justified in considering these two specimens as putative paratypes of Obenberger's species.

Having studied the male type of *X. brendeli* LeConte in the

Museum of Comparative Zoology at Cambridge in 1942, and having seen an almost identical male in the Boston Museum collection, I was a little unnerved at the sight of the two putative paratypes, both males of *X. vej dovskyi*, which looked quite different from the LeConte type, as well as different from the published figures in Knull, Horn, and Kerremans. However, I checked both paratypes against my table of dichotomies with the following results:

1. One of the paratypes is uniformly dark above, vaguely purplish on the elytra, a little brassy on the head and pronotum with no definite elytral markings whatever, merely a slight lightening on the side margin at about the middle of the elytra and a vague lessening of intensity of color where the elytral markings usually occur. These lighter areas can only be discerned by turning the specimen around and tilting it in a favorable light under fair magnification. To the unaided eye the elytra appear uniformly dark. The other paratype is colored about like Dr. Obenberger's figure of *X. vej dovskyi*. This indicates that the color of the elytra is an unstable character here since two of the putative paratypes are so differently marked. Dr. Obenberger did not mention this difference in color between two of the "specimens of the same new species."

2. The dark paratype has the body black with a slightly brassy tinge whereas the light paratype has the body shining black with no brassy tinge, indicating that this character is variable here, and by this token, valueless.

3. The dark paratype has a distinct median impression on the head whereas the light one has the front nearly evenly rounded with only a very slight impression, indicating that this character also is variable and useless.

4. The dark paratype has the pronotum medio-longitudinally narrowly impressed and transversely broadly medially depressed whereas the light paratype has neither impression, indicating that this character is variable (as, indeed it is also among certain other *Anthaxites* as well).

5. The dark paratype has the sides of the pronotum broadly arcuate from the anterior angles to the first fourth, then parallel to the posterior angles which are acute, whereas the light paratype has the pronotal margins about as figured by Dr. Obenberger for *X. vej dovskyi*, that is broadly arcuate from the anterior angle to the posterior fourth, then angling in more strongly to the posterior angles which are obtuse, indicating that this, too, is a variable character, and of no value here.

6. The pronotum of the dark paratype is noticeably less strongly transverse than that of the light one but is not truly quadrate, indicating still another variable and unusable character.

7. The length of the dark paratype is 5.3 mm. while the light one measures 6 mm. in length, another variable character.

8. Both paratypes were fastened with generous amounts of glue to little cards and the sterna were unobservable. I therefore carefully removed the specimens from their cards and found, in direct contradiction to Dr. Obenberger's statement, that the sterna of both paratypes were strongly modified at both sides by large conspicuous oblong oval hairy depressions.

Having an opportunity to visit the Museum of Comparative

Zoology again in 1950 I re-examined the LeConte type of *X. brendeli* and confirmed my previous impression that the two paratypes of *X. vej dovskyi* differ in general appearance at least as much between themselves as from the type of *X. brendeli*.

I believe that I have demonstrated that all of the characters, except one, which are said by *Dr. Obenberger* to separate *X. vej dovskyi* from *X. brendeli* are quite variable and useless in specific differentiation by pointing out the great differences which exist between two of the specimens which he said belong to his new species and which I feel justified in considering as paratype. The excepted character, a sexual one, is the possession of a large hairy depression on each side of the sternum, characteristic of *X. brendeli* and the absence of which was supposed to distinguish *X. vej dovskyi*. The condition of this important character is found to be exactly the same in specimens which *Dr. Obenberger* designated as representative of his new species as in the type of *X. brendeli*. *Xenorhipis vej dovskyi* *Obenberger* should be listed as a synonym of *Xenorhipis brendeli* *LeConte*.

MISCELLANEOUS NOTES ON THE TAXONOMY OF SOME APHID SPECIES

(Aphididae)

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Contarini (1845) lists 46 species of the genus *Aphis* as belonging to the family *Psyllidae*. Of these, seven species are incorrectly accredited to *Latreille*. One species, *Aphis nivea*, may or may not be correctly associated with the name of *Latreille*, but I have not been able to locate a species by that name in the works of *Latreille* which I have examined, neither have I been able to locate a species by the name of *Aphis nivea* in the literature. It may be regarded for the time being as a *nomen nudum*. The remaining species listed by *Contarini* are either correctly or incorrectly associated with the name of *Fabricius*.

In the February issue of "Entomological News," published in 1917, G. O. Shinji described as new *Myzocallis essigi*. The type slide of this species, now in the collection of E. O. Essig, contains a number of species representing several genera. Through the kindness of Professor Essig I have had an opportunity to study this slide. Essig (1917:324) regards the species named for him as a

synonym of *Myzocallis quercus* (Kaltenbach) a species which has since that time been recognized as a synonym of *Myzocallis annulatus* (Hartig). Swain (1919:17) is in error when he states that *M. essigi* is a variety of *M. quercus*.

In the same paper that Shinji described *M. essigi*, he also described as new *Myzocallis woodworthi*. The type slide, like that of *M. essigi*, contains a number of different species. It is in the collection of Professor Essig and has been seen by me. Unfortunately in his original description Shinji describes a male, which has since been indicated as the type, as an alate viviparous female. He further complicates matters by not adequately nor accurately describing the dusky areas on the abdomen, and compounds the confusion by attributing dorsal tubercles to the abdomen, structures absent on the male which he described and also lacking on the abdomen of a single alate viviparous female of the same species, mounted on the type slide. This would indicate that he was confusing specimens of *woodworthi* with *essigi*, there being several specimens of the latter species on the slide.

It should also be noted that figure II, plate VII, inaccurately illustrates the dusky areas on the abdomen; the sensoria on antennal segment three, indicate as does his explanation that the specimen is an alate viviparous female. It will be noted that the abdomen does not show the dorsal tubercles called for in the description. Figures 13, 14, 15, and 16 represent the antennal segments of the male, but are labeled as those of an alate viviparous female.

Professor Essig in 1917 regarded *M. woodworthi* as the male of *M. quercus* (Kaltenbach) and in this Baker concurred. Swain in 1919 considered *woodworthi* to be a variety of *M. quercus*. Both Essig and Swain were in error in their beliefs, both probably being led astray by Shinji mentioning the presence of dorsal tubercles on the abdomen. The specimens described by Shinji belong to the species named by Buckton *Callipterous castaneae* which Baker in 1917 renamed *Myzocallis castanicola* which name now becomes a synonym of *Myzocallis woodworthi* Shinji. *Myzocallis davidsoni* Swain is also a synonym of *woodworthi* as others have already indicated it as a synonym of the species named by Baker.

The following species are recorded from Colorado for the first time: *Thelaxes californica* Davidson taken on scrub oak at Skyway, Grand Junction, and Gateway, Colorado, during the summer and fall of 1949 and fall of 1950; and *Periphyllus americanus* (Baker) taken on sugar maple at Grand Junction in 1949.

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NEW RECORDS OF LEPTINUS TESTACEUS FROM
NORTH AMERICA

(Coleoptera: Leptinidae)

A single male specimen of *Leptinus testaceus* Müller was taken from the body of a shrew, *Sorex trowbridgii humboldtensis* Jackson, trapped in the vicinity of Prairie Creek State Park, Humboldt Co., California, June 15, 1951. The species has also been taken, but apparently not reported, at Port Angeles, Washington, May 25, 1907, by E. C. Van Dyke. Three previous North American records for this ectoparasite are the following: Cincinnati, Ohio, from nest of *Blarina brevicauda* (Say) (Charles Dury, 1892, Cincinnati Jour. Sci. 14:183); Forrester Island, Alaska, from the bodies of freshly killed shrews (V. L. Kellogg, 1914, *Science*, 39:360); Silver Creek (about 11 miles SW. of Salmon Arm), British Columbia, from a species of *Sorex* (G. R. Hopping, 1949, *Proc. Ent. Soc. Brit. Columbia*, 45:16).—D. J. GOULD and R. S. BEAL, JR.

A NEW TROPICAL HEBRID

(Hemiptera)

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The present paper contains the description of a new species of *Merragata*, family Hebridae, from Panama and Mexico. The types are in my collection.

***Merragata quieta* Drake, new species**

Macropterous form: Short, small, slender, brown, sometimes with the pronotum becoming darker towards the sides. Head brown, sparsely clothed with scattered pale hairs; median longitudinal furrow wide, divided by a narrow median ridge. Eyes small, reddish, coarsely faceted. Antennae short, slender, testaceous, shortly pilose; segments I, II, III subequal in length and thickness, pale testaceous; IV longer, stouter, brown, clothed with longer hairs; formula—I, 9; II, 9; III, 9; IV, 12. Rostrum long, slender, testaceous, reaching to base of metasternum. Legs slender, rather short, testaceous, sparsely clothed with short pale hairs. Middle and hind coxae widely separated so as to form a wide sternum, the sternum flattened or impressed.

Pronotum brown, often darkened laterally, moderately narrowed anteriorly, deeply pitted, shallowly longitudinally furrowed on median line, with a deep impression on each side just back of collar; humeral angles not very prominent, slightly impressed within. Exposed part of mesonotum very short, brown, not wider than scutellum. Scutellum small, brown, almost triangular in outline, with narrow median carina, the outer edges on each side also narrowly ridged; the length and width subequal. Hemelytra fumose with base and three spots in apical area white; two veins dark brown, prominent, narrowly separated with narrow space between them white, apically with the inner vein turned abruptly so as to unite obliquely the two veins, the posterior margin almost obliquely truncate (feebly rounded). Dorsal surface of head, pronotum and hemelytra sparsely and inconspicuously clothed with pale hairs, the veins of hemelytra more hairy than membrane; sides of body also with short hairs. Abdomen beneath fuscous-brown with bluish lustre. Apterous form unknown. Length, 1.55 mm.; width, 0.50 mm.

Type (male) and *allotype* (female), CANAL ZONE, PANAMA, Feb. 10, 1939, C. J. Drake, *Paratypes*: 6 specimens taken with type; 2 specimens, C. Valles, Mex., July 17, 1950, C. J. Drake; and 1 specimen, Rio Frio, Colombia, March 10, 1918, Darlington.

This tiny species is most closely related to *M. hebroides* B.-White, but separated from it by its narrowed form and much shallower pronotal sulcus. *M. brunnea* Drake is a lighter colored species with the part of vein connecting the two veins distinctly rounded instead of obliquely truncate.

An examination of the type of *M. slosson* Van Duzee in the California Academy of Sciences shows this species to be a synonym of *M. hebroides* B.-White (*new synonymy*).

NOTES AND A NEW SPECIES IN CYBAEINA

(Arachnida: Agelenidae)¹

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Since the erection of the genus *Cybaeina* for *Cybaeus minutus* Banks by R. V. Chamberlin and W. Ivie in 1932, two more species have been added, *C. xantha* Chamberlin and Ivie, 1937, and *C. confusa* Chamberlin and Ivie, 1942. The additional species, including *C. sequoia* n. sp. described in this paper, makes it necessary to broaden the previous concept of the genus.

The genus includes all those Cybaeinae which bear four or five pair of ventral spines on Tibia I and lack two stout spines on the anterior distal portion of Femur I. The internal female epigynum lacks bulbous spermathecae and the patella of the male palpus bears a small ectal process. The carapace and legs lack dusky markings, the abdomen is yellow or, in the case of *C. sequoia* n. sp., pale gray with very faint markings. Size over 2.8 mm.

These spiders are known only from the damp forests along the northern Pacific Coast. Of the four species, three are found in western Oregon, one of which extends into Washington. One species is described from northern California. Their habitat is similar to that of *Cybaeus*, i.e. under bark, rocks, boards, logs, and moss in damp coniferous forests. Webs are apparently seldom used.

CYBAEINA CONFUSA Chamberlin and Ivie

(Figures 2, 3, 6)

Cybaeina confusa Chamberlin and Ivie, 1942. Bull. of the U. of Utah, 32(13):19, fig. 38, (♀).

C. confusa Chamberlin and Ivie was described from "Oregon" from one female. Additional specimens show a variability in the structure of the female epigynum.

Externally the female epigynum consists of a thin and smooth sclerotized sheet with a single transverse median opening mesal to the posterior loop of the spermathecae. The opening is a faintly visible slit, slightly curved on the antero-lateral edge, forming an undulating edge. Posterior to the opening is a calvous area representing the "median sclerite." The convoluted spermathecae are visible through the sclerotized sheet as illustrated in fig. 3. The connecting canals are not visible. Lateral to the center of the spermatheca are two shallow depressions.

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The internal epigynum consists of two separate and more or less identical halves; one side is described. The transparent connecting canals arise on the median line on the posterior third of the sclerotized sheet. The canals are fused at the opening, extend dorsally a distance of about twice their diameter where they divide. Each canal extends laterally to the edge of the spermatheca, turns anteriorly and then ventrally where it connects with the heavily sclerotized spermatheca. The latter consists of a strongly convoluted and compact tube as illustrated in fig. 2. The position of the canals deviate somewhat in many specimens but the general pattern is the same. Posteriorly the spermatheca narrows abruptly, forming the fertilization duct.

Chamberlin and Ivie's illustration of the epigynum of *C. confusa* indicates two circular sclerotized areas at the posterior lateral edges of the spermathecae. These areas are visible only when the coils of the spermathecae are arranged in a certain position.

Male—Color: Carapace and legs whitish-yellow. Mouthparts and sternum light yellow. Eyes ringed with violet. Abdomen whitish-grey. No dark markings.

Structure: Typical of genus. Carapace widest opposite anterior end of the thoracic furrow. Thorax evenly convex, sloping forward to the eyes from a point about one-third the distance from the eyes to the thoracic furrow. Sides of head slightly convergent anteriorly. Posterior eye row slightly procurved. Anterior eye row slightly recurved. Eye ratio: AME : 3.7, PME : 5, ALE : 6, PLE : 6. AME about two-thirds their diameter apart, and less than a radius from the ALE. Lateral eyes about two-thirds their diameter apart. PME slightly less than two diameters apart and separated from the PLE by one and one-third diameters. Clypeus one and one-third diameters of an ALE. Chelicerae almost straight, three teeth on the promargin and three or four teeth and six very small denticles on the retromargin. Fang normal with usual row of overlapping hairs. Labium slightly wider than long, about half as long as the endites and indented slightly distally. Endites converge slightly distally. Dense scopula on mesal half of anterior margin and serrula present on lateral half. Sternum shield-shaped, longer than wide, produced to a point between the hind coxae.

Abdomen sub-ovate. Anterior and posterior spinnerets widely separated. Anterior spinnerets two-segmented, the basal segment slightly conical, the distal segment hemispherical. Posterior spinnerets two-segmented², similar in shape but more slender and shorter than the anterior spinnerets. Colulus divided, each half represented by one hair (other specimens have up to four or five hairs). Opening of the spiracle slightly anterior to the colulus.

Palpus typical for genus. Patella with a slender ectal process extending ectally at right angles and terminated by four teeth (three in some specimens). Tibia with a stout cariniform process ecto-ventrally extending almost its entire length. Embolus smooth for its entire length. Legs of moderate length. Tibiae I and II with four pairs of spines ventrally. All metatarsi with 2–2–3 spines ventrally. Tarsal claws bear 10–12 teeth, median tarsal claw bears 2–4 teeth.

² The author found that the posterior spinnerets of other genera of Cybaeinae, e.g. *Cybaeus* and *Cybaeota*, are at least secondarily segmented.

Measurements in millimeters:

Total length: 3.8. Average 3.46. (3 ♂ ♂) Range 3.15–3.8.

Carapace		Metatarsus	
length	1.80	I	1.26
width	1.46	IV	1.77
head width	.62		
eye width	.45		
Femur		Tarsus	
I	1.73	I	1.19
IV	2.04	IV	1.22
Tibia-Patella		Total	
I	2.14	I	6.32
IV	2.21	IV	7.24

Allotype: Male. Collected by the author one mile west of CASCADIA, OREGON, Sept. 5, 1948, with two additional males and three females.

The allotype is deposited in the California Academy of Sciences, San Francisco. The holotype is in the University of Utah at Salt Lake City, Utah.

Distribution: West side of the Cascade Mountains in Linn and Benton counties, Oregon. Wren, Nov. 19, 1950 (2 ♀ ♀); 27 mi. N.E. Sweet Home, March 7, 1948 (2 ♀ ♀); Foster, April 18, 1948 (♀); Mary's Peak, Benton Co., June 17, 1949 (♀) F. Beer; 1 and 13 miles E. of Cascadia, July 23, 1949 (♂ and 2 immature ♂ ♂) F. Beer and V. Roth.

Most of the immature or teneral specimens of *C. confusa* bear a pinkish pigment around the eyes. This was not present in older specimens. The females ranged in size from 3.2 mm. to 5.6 mm. with the average of 4.17 mm.

***Cybaeina sequoia* Roth, new species**

(Figures 1, 4, 5)

Holotype: Male. Color: Carapace light yellowish-orange with very slight traces of dusky markings. Eyes ringed with black. AME with a connecting black band as are the ALE and PLE. The black ring of the PME just touches the ring of the ALE. Chelicerae, endites, and labium brownish-orange. Sternum slightly lighter, darker around edges. Legs yellowish, becoming darker distally. Abdomen gray with a light median lanceolate mark over the heart. Two faint, light gray chevrons are present on the posterior half of the abdomen. Venter is light gray. Spinnerets yellow.

Structure: Typical of the genus. Carapace widest opposite anterior end of the thoracic furrow. Thorax evenly convex, sloping forward to the eyes from a point about one-third the distance from the eyes to the thoracic furrow. Sides of head slightly convergent. Posterior eye row moderately recurved. Anterior eye row straight. Eye ratio: AME:5.5, PME:9, ALE and

PLE:10.5. AME two-thirds of their diameter apart and slightly less than a radius from the ALE. Lateral eyes less than a radius apart. PME about one and one-third diameters apart and separated from the PLE by slightly less than their own diameter. Clypeus slightly narrower than the diameter of an ALE. Chelicera almost straight, three teeth on the promargin and four widely spaced teeth and seven denticles on the retromargin. Fang with usual row of overlapping hairs. Labium slightly wider than long, more than half as long as the endites and slightly notched distally. Endites converge slightly distally. Dense scopula on mesal half of anterior margin and serrula present on ectal half. Sternum shield-shaped, slightly longer than wide. The lateral edges are undulated and posteriorly the sternum is produced to a point between the hind coxae.



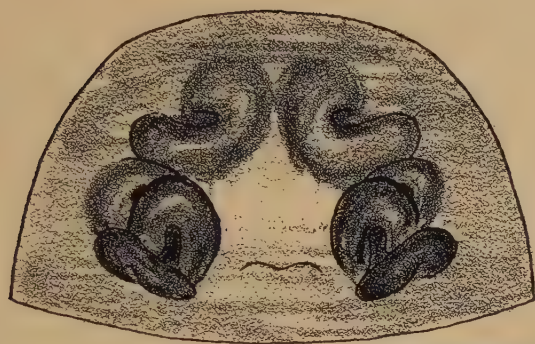
Fig. 1. Dorsal view (internal) of female epigynum of *Cybaeina confusa* Chamberlin and Ivie. Fig. 2. Same, of *Cybaeina sequoia* new species.

Abdomen sub-ovate, three-quarters as wide as long. Anterior and posterior spinnerets widely separated. Anterior spinnerets two-segmented, conical basal segment stout, distal segment short, hemispherical. Posterior spinnerets secondarily two-segmented, the distal segment very short, faintly visible with 40X magnification. Colulus divided, each half represented by two hairs. Opening of the spiracle slightly anterior to the colulus.

Palpus typical for genus. Embolus bears two recurved teeth flanked by a pair of shorter teeth about halfway from the base. Process of the patella arises ectally and curves distally. Right process bears four stout teeth and the left process bears five. (Most paratypes bear four teeth, one bears three). Tibia bears a stout cariniform process ectally, about two-thirds its length. Legs of moderate length. Tibiae I and II bear five pair of spines ventrally. All metatarsi bear three pair of spines. Upper tarsal claws bear nine teeth ventrally. Median tarsal claw bears six teeth ventrally.

EXPLANATION OF FIGURES

Fig. 3. Ventral view (external) of female epigynum of *Cybaeina confusa* Chamberlin and Ivie. Fig. 4. Same, of *Cybaeina sequoia* new species. Fig. 5. Ventral view of left palpus of male of *C. sequoia*. Fig. 6. Same, of right palpus of *C. confusa*.



3.



4.



5.



6.

Measurements in millimeters:

Total length 4.3. Average 9 ♂ ♂ 4.12 Range 3.7-4.4.

Carapace		Metatarsus	
length	2.38	I	1.90
width	1.84	IV	2.52
head width	.90	Tarsus	
eye width	.64		
Femur		I	1.39
I	2.35	IV	1.39
IV	2.55		
Tibia-Patella		Total	
I	3.06	I	8.70
IV	3.09	IV	9.55

Allotype: Female. Color: Similar to that of male but slightly darker. Abdomen light gray, no lighter markings.

Structure: Generally the same as the male. Sides of the head straight. Eyes slightly smaller, and ratio differs slightly: AME:5, PME:9, PLE:9.5, ALE:10. Posterior eye row recurved slightly more than in the male. Right chelicera with five teeth, eight denticles on the lower margin. Left chelicera with seven teeth, eight denticles on the lower margin.

Epigynum: The external epigynum consists of a thin and smooth sclerotized sheet with sclerotized depressions (lateral sclerites) anterior to the lateral connecting canals. The center of the sheet is crossed by a short, undulating, transverse lip formed by the fusion of the two open ends of the connecting canals. Posterior to the opening is a transversely ovate depression which is lined by a median trapezoidal sclerite. The connecting canals are visible through the sclerotized sheet as illustrated in fig. 4. (The positions of these canals deviate in the paratypes but have the same pattern).

Type Locality: The allotype, holotype, four female paratypes and eight male paratypes were collected by the author near PEPPERWOOD, HUMBOLDT Co., CALIFORNIA, August 12, 1950, in a redwood (*Sequoia sempervirens*) forest under boards and bark on the ground. One dead male was attached to the underside of a board by the mycelium of the fungus, *Torrubiella aranicida* Bond³. This fungus previously has been reported on spiders from France and Great Britain. The species is named after the sequoia trees which are prominent in the type locality.

The holotype and allotype will be deposited in the California Academy of Sciences. A male and female paratype will be deposited at the American Museum of Natural History and in the collection of Dr. R. V. Chamberlin at the University of Utah. A male paratype will be deposited in the collection of Mrs. D. L.

³ Identified by Paul L. Lentz of the U. S. Dept. of Agriculture, Beltsville, Md.

Frizzell (Harriet Exline) at Rolla, Mo. The remainder of the paratypes (6 ♂ ♂, 1 ♀) will be retained in the collection of the author.

Two paratypes were used for dissection and the following description and fig. 1 was taken from them. The internal epigynum consists of two separate and more or less identical halves. Each side consists of a long connecting canal which follows an irregular path as illustrated in fig. 1. Opposite to and slightly anterior to the connecting canal openings the connecting canal is swollen slightly and bears internally a dark colored globular mass similar to that found in the genitalia of some *Cybaeus*. A magnification of approximately 1,450 X indicates the presence of minute canals which ramify throughout the mass. The canal narrows abruptly posteriorly forming the fertilization duct which lies towards the median line.

Measurements in millimeters:

Total length 4.7. Average 3 ♂ ♂ 4.26. Range 3.8–4.7.

Carapace		Metatarsus	
length	2.24	I	1.67
width	1.63	IV	2.28
head width	.61	Tarsus	
eye width	.89		
Femur		I	1.19
I	2.11	IV	1.22
IV	2.21		
Tibia Patella		Total	
I	2.79	I	7.75
IV	2.99	IV	8.67

The curved process of the patella of the male will separate this species from previously known males. The pattern of the connecting canals of the female epigynum is distinct as illustrated.

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EDWIN C. VAN DYKE MEMORIAL ISSUE

With the death of Dr. Edwin C. Van Dyke on September 28, 1952, entomology and the Pacific Coast Entomological Society have lost one of the greatest pioneers. In tribute to his many accomplishments the January 1953 issue of the Pan-Pacific Entomologist will be devoted to his memory.—THE EDITORS.

NOTES ON FLIGHTS AND FOOD PLANTS OF PLEOCOMA

(Coleoptera: Scarabaeidae)

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During the third rain of the 1952 season (November 15), 26 males of *Pleocoma nitida* Linsley were collected close to the new Cross County Highway, 6 miles E. N. E. of Santa Margarita, San Luis Obispo County, California. As reported by Linsley (Pan Pacific Ent., 17:148, 1941), the probable food plants are *Adenostoma fasciculatum*, *Arctostaphylos* sp., and *Baccharis* sp. From my observations, the food plant probably is *Adenostoma*, possibly *Ceanothus*. The time of flight is similar to that of *P. conjungens* Horn (Hazeltnine, *ibid.*, 26:188-189, 1950), lasting from 4:55 p.m. to 5:25 p.m. in an intermittent light rain. The males of *P. nitida* are fast flyers and not attracted to lights.

Dr. J. A. Comstock (personal communication) reports that the males of *P. puncticollis* Rivers usually fly in the second or third rain and both day and night. After dark, the males are strongly attracted to light. The dominant vegetation is *Adenostoma* and *Ceanothus*, with the few larvae found apparently closer to the rootlets of *Ceanothus*.

While collecting November 14, 1952, on the Point Reyes Peninsula, Marin County, California (6 miles north of the light house gate), W. V. Garner and J. D. Lattin observed a flight of *P. sonomae* Linsley. This began about 2 p.m. and lasted about 15 minutes, the flight ending shortly after the start of precipitation. Thirty-seven males were collected during this flight. On November 16, 1952, J. D. Lattin dug out one male and one female in the same area and observed a male flying at sunset in clear, cool weather. The only food plant available to the female was the grass in the area. This association is similar to that of *P. hirticollis vandykei* Linsley in the Patterson Pass area, where the larvae have been taken feeding on grass roots (Ritcher, *ibid.*, 23:11, 1950).

F. Beer (personal communication) reports both sexes of *P. dubitalis leachi* Linsley collected in an area of *Pseudotsuga taxifolia*.

It would appear that the males of the seven lamellate group (Linsley, *ibid.*, 22:61-64, 1946) are crepuscular flyers during precipitation while the five lamellate males fly almost any time and under a wider range of climatic conditions.

BIOLOGY AND METAMORPHOSIS OF SOME SOLOMON
ISLANDS DIPTERA. PART II: SOLVA BERGI JAMES
(ERINNIDAE), WITH A COMPARISON OF
RELATED SPECIES*

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The general introduction to a proposed series of papers on biology and metamorphosis of some Diptera reared in the Solomon Islands during World War II is given in a previous paper (Berg, 1947). This second paper of the series concerns a species of Erinnidae, *Solva bergi*, recently described by Dr. Maurice T. James (1951) from specimens collected and reared by the author.

I am indebted to Dr. James, of Washington State College, for preparing the original description of *S. bergi*. Four larvae and puparia of *S. pallipes* (Loew), which proved valuable for comparative studies, were furnished by Dr. Alvah Peterson, of Ohio State University. A grant-in-aid from Ohio Wesleyan University enabled me to employ Mr. C. R. Roelofs, Jr., student at Ohio Wesleyan, who gave excellent assistance in the preparation of illustrations.

To ensure accuracy of proportions, tracings of micro-projector images were used as bases of all drawings. Larvae, puparia, pupae and adults of *S. bergi* are deposited at the United States National Museum for the convenience of future investigators.

Adults of *Solva bergi* were frequently observed resting on leaves of jungle undergrowth near the Tenaru River about one and one-half miles from the north coast of Guadalcanal. Their conspicuous black and yellow coloring and their habit of resting on the upper surfaces of leaves render them easily seen. All were in moist, shaded situations. Although they often flew when disturbed, they were captured readily in a net, and ten females and five males were collected in this way from September through December, 1944. Mating, oviposition and food habits of the adults were not observed.

On April 11, 1945, more than sixty larvae of this species were found in the moist, spongy, fermenting bark of a branch lying on the bank of the Tenaru River about two miles from its mouth. A

* Based upon rearing and biological observations made on Guadalcanal Island during 1944 and 1945, while on active duty in a Malaria Control unit of the United States Navy. The statements and opinions set forth are the author's and not necessarily those of the Navy Department.

variety of dipterous larvae lived in this sour smelling bark, feeding on it, on the fungus which it supported or on other larvae living in this material. Malloch, who found the larvae of *S. pallipes* under similar conditions, wrote (1917:342), "The *Xylomyia* [*S. pallipes*] larvae were found to be predaceous, feeding indiscriminately upon the other larvae." While it seems likely that larvae of *S. bergi* are also predaceous, observations in support of this suggestion are lacking. Other flies reared from this collection represent the families Chloropidae, Dolichopodidae, Mycetophilidae, Neriidae, Psychodidae, Stratiomyidae (four species) and Syrphidae.

The pulpy bark became progressively more liquid and more malodorous as it continued to ferment and decompose in the laboratory. It was finally reduced to a mass of dissociated fibers suspended in a thick, dark brown liquid, which was frequently decanted off to avoid the possibility of toxic effects upon, or asphyxiation of, the larvae.

Larvae of *S. bergi* move about relatively little. They made no attempt to leave the culture medium before pupation. Pupation occurs within the puparium (fig. 7), the leathery integument of the last stage larva, which undergoes no conspicuous change in shape such as that observed during formation of the puparia of *Cyclorrhapha*. Two or three days after cessation of larval movement, the outline of the pupa can be seen when light is transmitted through the puparium. A specimen thus observed as a pupa within the puparium on April 25 emerged as an adult seven days later.

Before emergence, each puparium splits along the mid-dorsal line throughout the mesothoracic, metathoracic and first abdominal segments, and more than half way back through the second abdominal segment (fig. 1). A transverse cleft between dorsal surfaces of the prothorax and mesothorax intersects the longitudinal slit and in some specimens extends around on the ventral side, detaching head and prothorax from the rest of the puparium¹.

The pupa works its way forward and upward through the longitudinal emergence slit until the head, thorax and first four abdominal segments are out of the puparium. Usually it stops in this position, with fifth abdominal segment in the emergence slit and sixth and seventh segments still within the puparium. This pupal

¹ It is evident from the description that the single specimen from which Townsend described the *S. pallipes* puparium (1893:164) lacked not only the head, as he stated, but also the prothoracic segment.

integument ruptures dorsally to produce a Y-shaped opening across the head and thorax, and the adult emerges, leaving the pupal exuvia loosely clasped in the puparium (fig. 6). A few pupae emerge completely from the puparium before yielding the adult fly (fig. 8).

Emergence requires several minutes. The emergence slit was noticed in a puparium at 11:20 a.m. At 11:25, the pupa was wriggling out. There were intervals of slow to moderate activity and intervals of rest. By 11:35, all but the last three segments of the pupa had emerged. Although it continued to move at intervals for the next ten minutes, it made no further progress. After an interruption of one hour in my observations, I found the adult fly emerged and active. The pupal exuvia was completely free from the puparium.

Twenty-four males and 35 females were reared from the collection made on April 11. Emergence began with a single specimen on April 30 and rapidly rose to a peak of 16 specimens on May 5.

A few additional specimens of *S. bergi* were reared from larvae found beneath moist bark of a fallen tree on April 19, 1945. This collection was also made on the bank of the Tenaru River, about one-half mile downstream from the April 11 collection, and the *S. bergi* larvae were again associated with larvae of several other species.

DESCRIPTION OF PUPARIUM

The known larvae of *Solva* and *Xylomyia* (as recognized by Steyskal, 1947) are broad and flat, distinctly segmented, composed of head, three thoracic and eight abdominal segments. They differ markedly from the elongate, subcylindrical, soft-bodied larvae of *Erinna* (= *Xylophagus*) and other genera of Erinidae, but they resemble Stratiomyidae larvae very closely. Like them, larvae of *Solva* and *Xylomyia* have leathery, thick integuments, which effervesce strongly when placed in dilute hydrochloric acid, apparently because they are covered or inlaid with calcareous deposits². Lundbeck (1907:79) wrote that the *Xylomyia* calcareous bodies are flat, superficial plates, in contrast to the nail-shaped processes of Stratiomyidae larvae. Considering larval characteristics, it is not at all strange that many investigators have regarded the species now referred to *Solva* and *Xylomyia* as constituting a sub-family of Stratiomyidae³.

²Such treatment with a dilute acid is an important step in cleaning these puparia before mounting them for study.

The problem of identifying larvae of these two genera is primarily one of distinguishing them from Stratiomyidae larvae and from each other. In order to determine which of the anatomical features observed in *S. bergi* occur also in other species of *Solva*, comparisons were made throughout this study with larvae and puparia of *S. pallipes* (Loew). Published descriptions and figures of larvae of three other species of *Solva* and *Xylomyia* were used in attempting to select characters which they possess in common and which distinguish them from all Stratiomyidae larvae. These species are *Solva marginata* Meigen, *Xylomyia maculata* (Meigen) and *X. varia* (Meigen).

Since the integument of the last stage larva is not altered in shape when pupation occurs within it, and since emergence finally leaves this integument more clear and more easily studied than is the larva, most descriptions of *Solva* and *Xylomyia* larvae are based upon this empty larval skin or puparium.

The puparium of *S. bergi* (fig. 7) measures $2.0 - 2.8 \times 7.4 - 9.2$ mm. The larval integument is inlaid with small plates or scales which give it an appearance not unlike that of pebbled leather (fig. 9). Some of these scales are distinctly darker than others, and the pigmented ones are distributed in patterns which are fairly constant and characteristic (figs. 1, 2, 3).

Conspicuous smooth, clear areas, in which the small scales and the reticulated, shagreened appearance of the integument produced by them do not occur, are found on both prothorax and mesothorax of *S. bergi*. Single, large, median clear areas occur on dorsal surfaces of both segments (fig. 1), while on the ventral surfaces three clear areas are found on the prothorax, and two on the mesothorax (fig. 2).

Malloch (1917:317), who regarded the "Xylomyiinae" as a subfamily in Stratiomyidae, used: "Thoracic segments 1 and 2 each with a smooth plate on dorsum," as a key character to distinguish these larvae from those of other subfamilies of Stratiomyidae. Unfortunately, he confused this situation by mentioning in his

³Although Séguy (1926: 81) placed these species in Erinniidae, he divided this family into Xylomyiinae, all known larvae of which are the flat, stiff-bodied type herein discussed, and Erinniinae, larvae of which have elongated, subcylindrical bodies covered with thin, flexible integuments. This division, based upon adult characters, tends to support the conclusion inevitably reached by students of life cycles and immature stages, that the family Erinniidae includes two remotely separated phylogenetic groups.

description of *S. pallipes* (p. 342), "a pair of narrow transverse plates on dorsum of metathorax," where he undoubtedly meant to write, "mesothorax." As illustrated by Peterson (1951: fig. D 13: B), the paired, transverse clear areas on dorsum of mesothorax of *S. pallipes* almost touch each other at the mid-dorsal line. In addition, *S. pallipes* larvae have single, median clear areas on both dorsum and venter of the prothorax, but none occur on the metathorax nor on venter of mesothorax.

Although the failure of European authors to mention anything as conspicuous as these features would seem to indicate that they do not occur on *S. marginata*, *X. maculata* and *X. varia*, such a conclusion should not be adopted until the larvae in question have been reexamined. These clear areas may characterize larvae of all species of *Solva*. If *Xylomyia* larvae also possess them, the character may prove valid for distinguishing larvae of these two genera from all Stratiomyidae larvae. Differences in number, form and distribution of these areas seem to be valuable in specific identification. It is the most conspicuous and least variable trait found to distinguish larvae of *S. bergi* from those of *S. pallipes*.

Mesially, on venters of abdominal segments five and six, larvae of both *S. bergi* and *S. pallipes* have small, oval areas of noticeably lighter integument (fig. 9). While the clear areas on the thorax have no scales and appear quite homogeneous, the abdominal light areas have small, pale integumentary scales.

On the ventral surface, there is a transverse row of small, blunt spicules near the anterior margin of each of the first seven abdominal segments of *S. bergi* (fig. 9). The venter of each of the first six abdominal segments has a single, continuous row, usually made up of 17–19 spicules. On the seventh segment, the row is interrupted mesially and is composed of only eight or nine minute, poorly developed spicules. On the dorsal surface, abdominal segments two through seven bear rows of larger, fewer spicules near their anterior margins (fig. 1). The dorsum of the seventh abdominal segment usually has 10 or 11 spicules, and each of the others characteristically has 12–14.

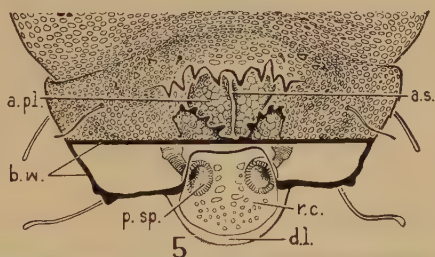
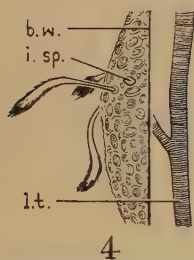
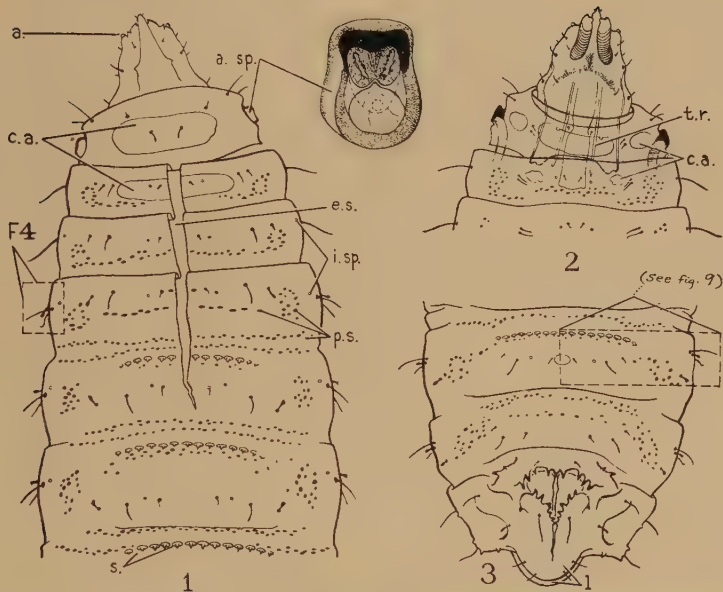
Slightly smaller numbers of spicules occur on abdominal segments two through six of *S. pallipes*. Each has 13–17 on the venter and 8–11 on the dorsum. There is a row of small, rudimentary spicules on the ventral surface of the first abdominal segment. None occur on the seventh abdominal segment.

It is evident that larvae of all species considered here bear these rows of abdominal spicules on one or both surfaces of some abdominal segments. Austen (1899:185) wrote that, while other investigators had reported these structures on *S. pallipes*, *S. marginata* and *X. varia*, they do not occur on the larva which he was then describing, *X. maculata*. However, Lundbeck (1907:80) pointed out that, "On the anterior margin of some of the ventral segments there is a transverse row of small warts," and Séguy (1926: fig. 222) illustrated these spicules in a ventral view of the *X. maculata* larva.

Anterior spiracles (fig. 1) are conspicuous on the first body (prothoracic) segment of both *S. bergi* and *S. pallipes*. The lateral face view of each spiracular plate shows two oblique slits in the anterior half and what may be a third opening behind them. So many lines appear in so many levels in the posterior half of this spiracular plate that it is very difficult to interpret. The large circular area apparently regarded as a hole by both Malloch (1917: Pl. 48, fig. 9) and Greene (1926: fig. 1:a) is a structure sculptured superficially with fine lines in both *S. bergi* and *S. pallipes*. This appears to be a thin, leaf like shield, attached anteriorly near the two oblique slits. A smaller circle, seen in slightly deeper focus within the larger one, may be the rim of a hole, the third opening into the spiracular plate. Still deeper, an inner rim of the heavily

METAMORPHOSIS AND IMMATURE STAGES OF *Solva bergi*

Fig. 1. Head and first six body segments of empty puparium in dorsal view, with lateral face of anterior spiracle enlarged at right. *a.*, antenna; *a. sp.*, anterior spiracle; *c. a.*, clear areas lacking integumentary scales; *e. s.*, emergence slit; *F. 4.*, area enlarged in Figure 4; *i. sp.*, intermediate spiracles; *p. s.*, pigmented scales; *s.*, spicules. Fig. 2. Head and first two body segments of cleared puparium, with tracheal trunks and posteriorly projecting skeleton of head showing through ventral body wall. *c. a.*, clear areas; *t. r.*, tectorial rods. Fig. 3. Ventral view of last three segments of puparium. *L.*, lips of respiratory chamber; (see area enlarged in Figure 9). Fig. 4. Enlarged lateral margin of first abdominal segment, with dorsal body wall cut away to show main tracheae. *b. w.*, cut edge of body wall; *i. sp.*, intermediate spiracle; *L. t.*, longitudinal tracheal trunk. Fig. 5. Ventral view of eighth abdominal segment, with portion of ventral body wall and ventral lip and ventral wall of respiratory chamber removed. *a. pl.*, anal plate; *a. s.*, anal slit; *b. w.*, cut edge of body wall; *d. L.*, dorsal lip of respiratory chamber; *p. sp.*, posterior spiracle; *r. c.*, dorsal integument of respiratory chamber. Fig. 6. Adult fly and exuviae of larva and pupa, showing how the latter usually remains in emergence slit of puparium. Fig. 7. Empty puparium, viewed with transmitted light. Fig. 8. Lateral view of pupa.



6



8

sclerotized spiracular wall is clearly evident, and behind that the spirally thickened tracheal trunk can be seen running back into the body.

Posterior spiracles (fig. 5) open through the dorsal wall of the respiratory chamber in the last (eighth abdominal) segment. These flared, bell-shaped spiracles have broad, nearly circular rims or peritremes partitioned off by radiating rods into 26–31 equal sections. Grossly, the posterior spiracles and respiratory chamber of *S. pallipes* appear very similar to those of *S. bergi*, but the former have peritremes made up of 32–39 little sections.

The respiratory chamber, walls of which are sparsely supplied with sclerotized scales, opens to the outside by means of a terminal, transverse slit between conspicuous dorsal and ventral lips (fig. 3). When the whole puparium of either *S. bergi* or *S. pallipes* is examined with transmitted light, these lips and the area of the respiratory chamber appear darker and quite distinct from the rest of the segment (fig. 7). Several authors (e.g. Brauer, 1883: 23; Malloch, 1917: 342) have pointed out how much this area appears like an additional segment, and two (Townsend, 1893: 164; Lundbeck, 1907: 79) seem actually to have mistaken it for a diminutive twelfth body segment. Brauer, who regarded the species now referred to *Solva* and *Xylomyia* as *Subula* spp., Stratiomyidae, proposed what appears to be a valid key character for distinguishing these larvae from those of all other genera of Stratiomyidae. He wrote (1883: 23), "Letzter Ring halbrund, abgestutzt, . . . hinten mit deutlich segmentartig abgesetzten Lippen der queren Stigmen-spalte." Sharp's character (1909: 35), that the orifice of the respiratory chamber is terminal, "looking backwards," is less valuable, since this condition also exists in larvae of the Stratiomyinae.

Intermediate spiracles are not easily seen. Sharp wrote categorically that larvae of this group are amphipneustic, and Austen (1899: 188) emphasized their apparent lack of intermediate spiracles as a means of distinguishing them from larvae of Stratiomyidae. While Lundbeck detected small and indistinct spiracular plates on the first seven abdominal segments (presumably of *X. maculata*), he wrote (1907: 80), "these spiracles are certainly not in function." Inconspicuous spiracles were found near lateral margins of the metathoracic as well as the first seven abdominal segments of both *S. bergi* and *S. pallipes* (fig. 1). Tracheal branches connect these spiracles with the longitudinal tracheal trunks (fig. 4), but

no experimental evidence of function or lack of function was obtained.

The head of *S. bergi* is bluntly conical, with small antennae at the anterolateral corners and with bristles distributed as shown (figs. 1, 2). Parts of the cephalic skeleton which protrude back into the thorax are shown in figure 2. Bischoff (1924: 5), who treated this group as Stratiomyidae: *Subula*, mentioned the occurrence of well developed, wholly sclerotized tectorial rods as a character to distinguish the larvae from those of the (other) Stratiomyidae. These structures are well developed and completely sclerotized in both *S. bergi* and *S. pallipes*.

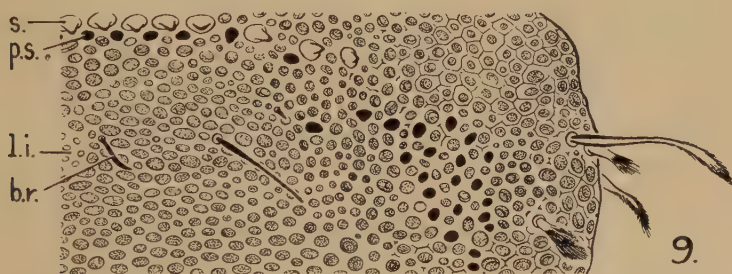


Fig. 9. Enlarged left half (approximately) of sixth abdominal segment of puparium in ventral view. br., bristle; l. i., oval area of light integument; p. s., pigmented scale; s., spicule.

The last segment of the *S. bergi* puparium bears the anus ventrally as a median longitudinal slit, surrounded by short spines or denticles which point in several directions (fig. 5). Malloch (1917: 317) used the conspicuous denticles just anterior to the anal slit to distinguish these larvae from those of the Stratiomyidae. This seems to be a valid character, but it should be noted that the "transverse series of short teeth" is in some species often broken into a median and two lateral portions, the latter extending more obliquely than transversely (fig. 3; Séguy, 1926: fig. 220). Contrasting the number, positions, sizes and directions of denticles illustrated in Figure 3 with those in Figure 5 shows considerable variation in these structures among different specimens of *S. bergi*. With respect to this character, there is greater similarity between some *S. pallipes* larvae and Figure 5 than there is between the specimens of *S. bergi* from which Figures 3 and 5 were drawn.

Each body segment, except the first and the last, of both

S. bergi and *S. pallipes* bears three pairs of bristles dorsally and three pairs ventrally, well removed from the lateral margins. Some of these (e.g. the most lateral pair on ventral surfaces of abdominal segments) are minute and difficult to find. Most of the marginal bristles of my specimens of *S. pallipes* are broken off. Those still present correspond approximately in size and position with those of *S. bergi*.

On the puparium of *S. bergi*, two bristles occur near each lateral margin of the prothorax, one on each margin of mesothorax and metathorax, and four bristles are found at or near each lateral edge of abdominal segments one through seven (fig. 9; figs. 1-4). Three of these four are attached slightly ventral to the margin, and the posterior one is so short that it does not project beyond the lateral edge. The three that do project shift relative positions somewhat on the various segments. On the anterior abdominal segments, the shortest bristle is anterior to the two long ones, the bases of which are directly above and below one another (fig. 4). On posterior segments, the long ventral bristle is anterior to all others. All of these marginal bristles appear plumose near their tips when magnified 60 diameters or more (fig. 9).

Bristles on the thorax of *S. bergi* are distributed as shown (figs. 1, 2). Those on the venter of the terminal segment are depicted in fig. 3. Dorsally, this segment has three large tubercles in a transverse row near the anterior margin and bears a single plumose bristle just anterior to each end of the lips of the respiratory chamber.

DESCRIPTION OF PUPA

Pupae of all five species considered here emerge partly or completely from the puparia before yielding adult flies. This contrasts with emergence of all reared Stratiomyidae, adults of which escape directly from the puparia, leaving pupal exuviae completely enclosed.

Mature pupa of *S. bergi* (fig. 8) apparently very similar to that of *S. pallipes*; covered by a thin, yellow, transparent integument, through which color markings and bristles of enclosed adult are distinctly visible. Length 5.2-6.5 mm.; greatest width of head (to tips of antenna cases) 1.4 mm.; maximum width of thorax (including wing pads) 1.7-1.75 mm.; widest abdominal segments 1.43-1.5 mm. Antenna cases large, pointing laterally, annulated to their tips. Thorax slightly deeper dorsoventrally (1.5 mm.) than long (1.4 mm.). Wing cases usually reaching middle of third abdominal segment; a few extending to its apex. Cases of metathoracic legs reaching approximately to apex of fourth abdominal segment. Prothoracic

spiracles shaped as illustrated (fig. 1-d) by Greene, situated on small elevations on anterolateral margins of thorax. Other thoracic spiracles described by Townsend not apparent on either cleared pupae or pupal exuviae. Abdomen cylindrical, composed of eight segments. First and last segments without bristles; all segments bare on ventral surfaces. Segments 2-7 each with a transverse row of appressed, yellow, spinelike bristles, just posterior to middle of segment, directed posteriorly. Each long bristle surrounded at base by several shorter ones, the whole group attached to a single tubercle. Segments 1-7 with small, slightly elevated spiracles on lateral surfaces anterior to middle of segment⁴. Apex of last segment distinctly bilobed laterally in both sexes.

SUMMARY

Adults of both sexes of *Solva bergi* were taken in nets from September through December, 1944, as they rested on jungle undergrowth near the north coast of Guadalcanal Island.

Two groups of *S. bergi* larvae were collected in April, 1945, associated with dipterous larvae of several other species, in and beneath the moist, fermenting bark of fallen timber. Adults were reared from both collections.

Anatomical features of larvae, puparia and pupae of *S. bergi* are described with the aid of nine figures. To determine which of these features occur also in other species of *Solva*, comparisons were made with larvae and puparia of *S. pallipes*.

Larvae of *Solva* and *Xylomyia* differ markedly from those of other Erinnidae, but they resemble Stratiomyidae larvae very closely. Published figures and descriptions of *S. marginata*, *Xylomyia maculata* and *X. varia* larvae were consulted to find valid characters for distinguishing them and the two species examined from all Stratiomyidae larvae. The following traits, all common to *S. bergi* and *S. pallipes* and some reported also for other species of *Solva* and *Xylomyia*, may prove valuable in identifying immature stages of these two genera.

1. On thoracic segments one and two, larvae of *S. bergi* and *S. pallipes* have conspicuous smooth, clear areas, the number and distribution of which provide an excellent means of distinguishing these two species. These scaleless areas, unfortunately not mentioned by most European

⁴ Lack of elongated respiratory processes which protrude through holes in the puparia may distinguish these pupae from those of the Stratiomyidae which have terrestrial larvae. Although they have escaped the notice of nearly all investigators, tubular respiratory processes such as those which thrust out through puparial integuments of all terrestrial Stratiomyidae reared by the author may occur generally on terrestrial pupae in this family. Protruding dorsolaterally near each spiracle on the first few abdominal segments, these structures would seem to anchor the pupae so effectively as to prevent their emergence.

- authors, may either characterize larvae of the genus *Solva* or help to distinguish *Solva* and *Xylomyia* from all Stratiomyidae larvae.
2. Transverse rows of small, blunt spicules occur on one or both surfaces of most abdominal segments of *S. bergi*, *S. pallipes*, *S. marginata*, *X. varia* and *X. maculata*. Differences in numbers of spicules are useful in specific identification.
 3. *S. bergi* and *S. pallipes* larvae have anterior, posterior and intermediate spiracles similar to those of Stratiomyidae, but the prominent lips of their posterior respiratory chambers are quite distinct. Terminal segments of all known larvae of *Solva* and *Xylomyia* have peculiarly interrupted outlines, with the protruding lips of the respiratory chamber appearing like an additional segment.
 4. The cephalic skeletons which extend back into the thorax of *S. bergi* and *S. pallipes* larvae include well developed, wholly sclerotized tectorial rods.
 5. A transverse series of short denticles (sometimes broken into a median transverse and lateral oblique portions) occurs just anterior to the anal slit on all *Solva* and *Xylomyia* larvae considered here.
 6. Pupae of all reared species of *Solva* and *Xylomyia* emerge partly or completely from the puparia before the pupal integuments rupture to yield adult flies.
 7. Pupae of *Solva* and *Xylomyia* differ from those of most terrestrial Stratiomyidae in lacking tubular, protruding respiratory processes.

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A NEW GENUS AND SPECIES OF APHIDAE ON SCOTCH BROOM IN OREGON

(Homoptera)

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Gentnera Essig, new genus

(Figures 1-2)

Body elongate with small acorn-like tubercles on the head and body of the alates and on the head of the apterae; body tubercles on aptera finger-like, short anteriorly and gradually lengthening posteriorly and arranged in 2 pairs on the prothorax, 2 small pairs and 2 larger pairs on mesothorax and 2 pairs on the mesothorax and all abdominal segments, excepting the last which has a single pair. The marginal tubercles longer. The pair supporting the cornicles in the alate are not greater than the others, but in the aptera they are much reduced in length. Antennae 6-segmented; slightly longer than half the length of the body; with elongate or oval secondary sensoria; unguis slightly more than half the length of the base; imbricated and with very short hairs. Compound eyes normal, with basal tubercle. Rostrum extends nearly to the second coxae, rather blunt. Legs short. Wings normal aphist-type excepting the media which is vestigial or absent, and the cubitus of the hind wings may be absent or present. The hamuli consist of but 2 acutely curved hooks. Cornicles very small—almost pore-like, situated on the base of abdominal marginal tubercles VI. Anal plate bilobed and with few hairs. Cauda knobbed with wide base and few hairs.

Body tubercles on alate parthenogenetic female and on alate male acorn-like. Secondary sensoria occur on antennal segment III of alate and apterous

parthenogenetic females and on segments III–VI of the alate male. Other characters may be noted in the accompanying illustrations.

This genus somewhat resembles *Anomalaphis* Essig but differs in having many less body tubercles which lack terminal setae and have much reduced and differently shaped cornicles.

Type species: *Gentnera oregona* new species.

***Gentnera oregona* Essig, new species**

(Figures 1–2)

TYPE: *Alate parthenogenetic female* (Fig. 1).—Small, black and yellowish- or greenish-gray with 2 marginal rows of dark pigmented areas at the bases of the lateral abdominal tubercles and 2 rows of larger transverse pigmented areas on the dorsum of the abdomen; head, thorax and appendages dusky to black. The pigmented areas may be finely imbricated. Front of head with 2 short tubercles each tipped with a small capitate seta. Antennal segment I large, rugose and with several inconspicuous hairs. Other segments as figured. Segment III with 7–9 oval secondary sensoria. Rostrum as drawn; extends nearly to 2nd coxae; has few short hairs. Forewings with aphid-type venation, but the radial sector represented only by a vestigial apical pattern. Hind wings small with normal venation as illustrated. The hamuli consist of 2 acutely curved hooks. Legs rather small with short hairs. Cornicles small, truncate, broader than long; situated at the bases of lateral tubercles. Genital plate oval with many fine short hairs. Anal plate bifurcate and with 2 long curved bristles and a few short hairs. Cauda knobbed with wide base; with 2 long and several smaller spines.

Length of body 1.20 mm.; antennae 0.80 mm.; wing 1.50 mm.; hind tibiae 0.50 mm.; cauda 0.10 mm.

Apterous parthenogenetic female.—Body narrowly elongate, grayish or dusky because of many transverse dark broken bands; dusky antennae and legs. The pair of tubercles on vertex more prominent than in the alate. Many conspicuous finger-like tubercles, colorless, imbricated and devoid of spines and setae. Three pairs of small dorsal tubercles on head, 1 median pair on pronotum and 2 pairs on metanotum acorn-shaped, whereas all other tubercles are arranged in a double series down middle and along each lateral margin as figured. There are 12 pairs counting the apical 2 pairs on segment VII. Antennae short, 6-segmented; nearly circular secondary sensoria present on segment III in the following combinations on various individuals: 1–2, 2–2, 2–3, 3–4, 4–0, 4–4, and 4–5. Legs short and rather stout. Rostrum much as in alate; cornicles somewhat broader than in alate. Anal plate and cauda much the same as in the alate. Length of body 1.50 mm.; width 0.60 mm.; antennae 0.80 mm.; hind tibia 0.45 mm.; longest body tubercle on segment V 0.20 mm.; shortest segment VI bears the cornicles.

Apterous oviparous female.—Similar to apterous parthenogenetic female, differing by being smaller and in having fewer secondary sensoria on antennal segment III, distributed in the following combinations per individual (number of individuals in parenthesis): 0–3 (1), 1–2 (3), 2–2 (3), 2–3 (7), 2–4 (3), 2–5 (1), 3–3 (7), 3–4 (2), 3–5 (1), 4–4 (1), 4–5 (1), 4–6 (1), representing a total of 31 specimens. Hind femora thickened and bears about

20 sexual sensoria of different sizes, the number variable and the sensoria quite often rather indefinite and indistinct. Head tubercles may project forwards in immature forms. Length of body 1.40 mm.; width 0.55 mm.; length of antennae 0.60 mm.; hind tibiae 0.40 mm.; cauda 0.10 mm.

Male: alate; somewhat smaller than alate parthenogenetic female, coloration much the same. Wing venation also after the same pattern with radial sector of forewings rudimentary or absent and cubitus of hind wings present or absent; in general aspects and color pattern quite like that of alate parthenogenetic female. Cauda, anal plate and sexual organs as illustrated. Secondary circular sensoria occur on all antennal segments excepting I and II. For 16 individuals they were distributed according to the following pattern (the number in parenthesis represents the number of specimens ex-

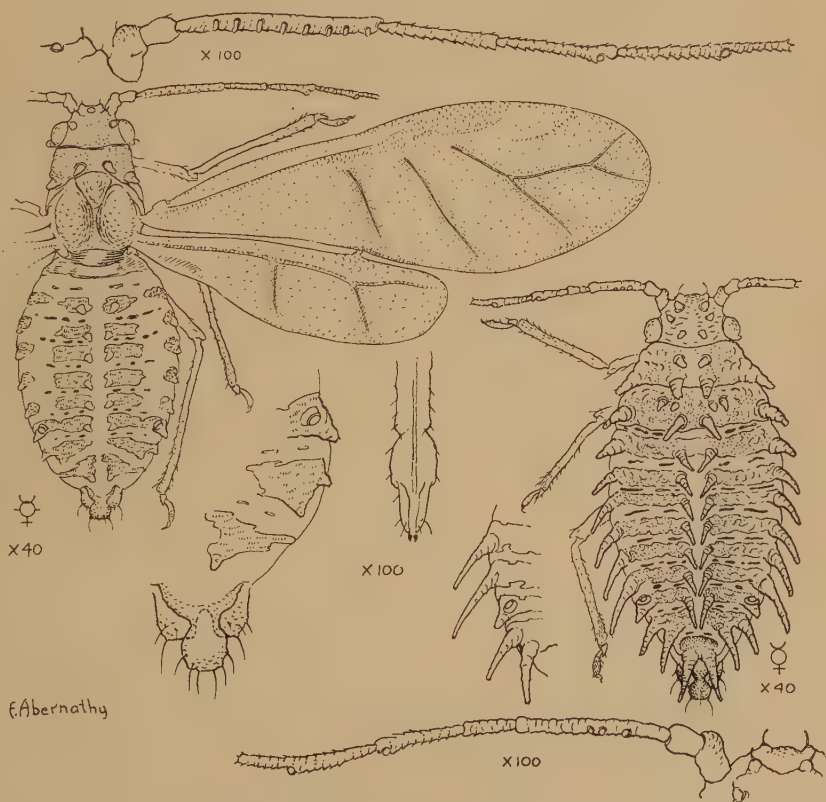


Fig. 1. *Gentnera oregona* Essig, n. sp. Alate and apterous parthenogenetic females together with enlargements of the antennae, rostrum, a portion of the abdomen, and the anal plate and cauda, rostrum, portion of abdominal margin of segments IV–VIII showing tubercles and cornicle, and antenna and front of the apterous form. Enlargements indicated. (Drawings by Frieda Abernathy.)

amined): **III**: 8-x (1), 9-12 (1), 10-10 (2), 10-11 (5), 10-13 (1), 11-11 (4), 11-12 (2); **IV**: 0-2 (1), 1-1 (7), 1-2 (4), 2-x (2), 2-3 (1), 3-3 (1); **V**: 1-x (2), 1-2 (6), 2-2 (4), 2-3 (1), 2-4 (1), 3-x (1), 3-3 (1); **VI**: 1-1 (3), 1-2 (4), 1-3 (2), 2-2 (5), 2-3 (2). (x indicates the other member was missing or hidden).

Paratypes show the following variations: secondary sensoria on antennal segment III vary in combinations per individual as follows: 7-8, 9-9, 12-13.

In the venation of the primary wings the radial sector may be completely absent or represented by an apical remnant. In no case noted was the vein complete. In the hind wings the media was present in all specimens but the cubitas was absent in 13 individual wings and present in 21 (males and alate parthenogenetic females).

Type—The type is an alate parthenogenetic female—mounted on a slide with a number of apterae and young. All the other specimens are designated as paratypes.

The collection studied consists of 244 adults and a number of young mounted on 28 slides.

Host Plant and History: This very interesting species was first collected on seedlings of "English broom" in his garden at Medford, Oregon, July 24, 1951, by L. G. Gentner, Entomologist and Assistant Superintendent of the Southern Oregon Branch Experiment Station, Medford, Oregon. He stated that "young plants were practically defoliated." This first lot consisted of alate and apterous parthenogenetic females in all stages of development. The specimens were so interesting and so different from any species heretofore collected in western North America that a great effort was made to find their origin. I immediately informed Mr. Gentner of his find and requested more information regarding all possible host plants and distribution. During the remainder of the year Mr. Gentner made more extensive collections and observations. He secured the sexual males and females, but could find them on no other hosts than the "English hybrids of Scotch Broom, *Cytisus scoparius* L." which his wife was growing in the garden. These seedlings were about 18 inches high and were considerably injured by the aphids. An examination of the surrounding country revealed no additional infestations. In October, Mr. Gentner visited the Moyer's Nursery, near Roseburg, Oregon from which the original plants had been obtained. "There

was only one shrub of this broom left, and I could find no aphid infestation." In summing up the situation Mr. Gentner wrote me (Sept. 17, 1951) as follows: "I haven't the least idea where this species could have originated but shall make an effort to determine other host plants and other infestations if possible."

The genus is named for L. G. Gentner, Entomologist of Oregon State College, who discovered and collected this and other interesting new species of aphids.

Since writing this paper the writer has received from F. L. Blanc, Bureau of Entomology, California State Department of Agriculture, a few specimens of this species collected by D. Zuckswert on the leaves of Scotch broom at Stockton, California, June 4, 1952. It would appear from this that the species may be quite widely distributed.

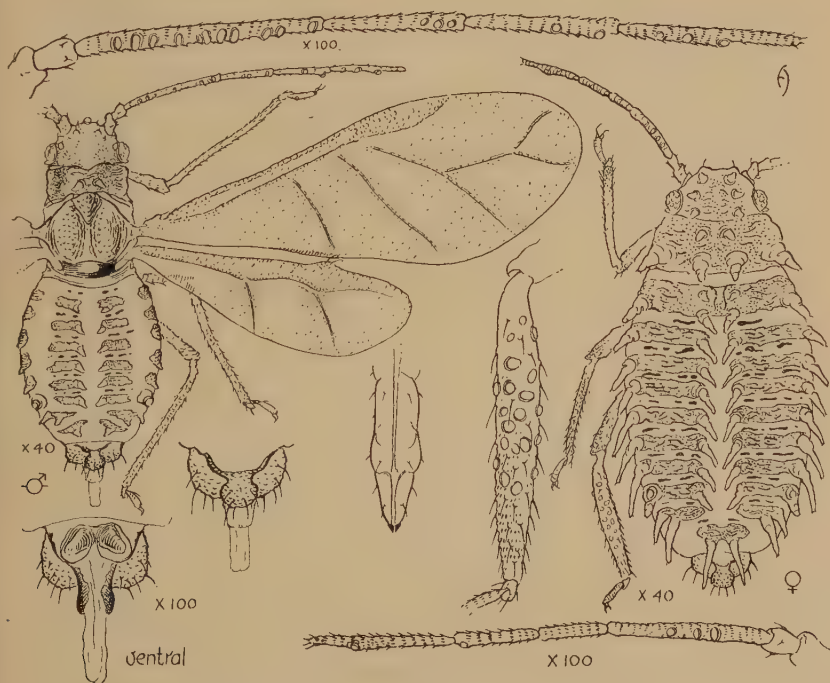


Fig. 2. *Gentnera oregona* Essig n. sp. Alate sexual male and apterous oviparous female with enlargements of the antenna, cauda and sexual organs of the male and the rostrum, hind tibia showing sexual sensoria, and the antenna of the female. Enlargements indicated. Drawings by Frieda Abernathy.)

A LECTOTYPE DESIGNATION IN THE
GENUS *EULONCHUS*

(Diptera: Acroceridae)

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Through the courtesy of Professor Dr. Fritz Peus of the Zoologisches Museum of Berlin, Germany, I was able to borrow for examination one of the two type specimens (cotypes) of *Eulonchus smaragdinus* Gertaecker. This specimen, a male, collected by von Müller in California, bears the following labels: a green locality and collector label; a red "Type" label; a white label with the number "1251"; a green label with "*smaragdinus* Gerst.*", and a second green label with the locality and collector. According to correspondence received from Prof. Dr. Peus, the other cotype in the Zoologisches Museum also has a red "Type" label.

In comparing the specimen on hand with the original description (Stett. Ent. Zeit., XVII:360-361, 1856), it was found to differ only in its general coloration, being more nearly metallic blue than bright emerald green. It was also interesting to note that each antenna had one apical seta, a character which was not mentioned by Gerstaecker, but rather was first discussed as a character of this species by Sabrosky (Amer. Mid. Nat., 39:388, 1948). The specimen is in perfect condition except for the missing apical half of the right middle leg and a somewhat deflated lower corner of the left eye.

Since no information has been found on the type designation of this species, this specimen is hereby designated as the lectotype of *Eulonchus smaragdinus* Gerstaecker.

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 ERRATA, Volume XXVIII

- p. 24, last line should read: couplet 9 in the key to the species of *Ameletus* given by Traver on p. 447 of *The Biology of Mayflies*, and *A. facilis*, n. sp. is closely related to . . .
- p. 28, for Fig. 4 *P. genitalia*, read Fig. 4 *P. clara*, genitalia . . .
- p. 72, and subsequent verso pages through 124, as well as in separates and reprints therefrom: read Vol. XXVIII for Vol. XXIII, in the running head.
- p. 75, in paragraph 1, the scientific names of the California nutmeg and the western yew should be transposed.